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1976 Cattlemen's Day: Buffalo to Beef, 1776-1976

Kansas Agricultural Experiment Station

CATTLEMEN'S DAY 1976 ● March 5, 1976
Report of Progress 262 ● Department of Animal Science & Industry ● Weber Hall ● Agricultural Experiment Station
Kansas State University, Manhattan
Floyd W. Smith, director

1776-1976
"Buffalo to Beef"

63rd Annual

CATTLEMEN'S DAY

Friday, March 5, 1976

STOCKMEN'S DINNER

THURSDAY, MARCH 4, 1976

Earl C. Brookover Appreciation Evening

6:30 p.m. Manhattan Country Club

Reservations are $7.00 per person and should be sent by March 1 to:
Department of Animal Science and Industry
Weber Hall
Kansas State University
Manhattan, Kansas 66506

FRIDAY, MARCH 5, 1976

8:00 a.m. Weber Hall Arena

Registration — Exhibits
(Coffee and Donuts served)

9:45 a.m. Weber Hall Arena

Dr. Don L. Good, Head, Department of Animal Science and Industry, KSU, presiding.

Welcome: Dr. Roger L. Mitchell, Vice President for Agriculture, KSU.

Genetic Potential and Cowherd Management, Dr. Robert Schalles, Department of Animal Science and Industry, KSU.

Silage and Cattle Growing Rations, Dr. Keith Bolsen, Department of Animal Science and Industry, KSU.

Native Grass Management for Greater Profits, Dr. Ed F. Smith, Department of Animal Science and Industry, KSU.

Improving Palatability of Grass Finished Beef, Dr. Curtis Kastner, Department of Animal Science and Industry, KSU.

Rumensin—A New Feed Additive for Feedlot Cattle, Dr. A. P. Raun, Head, Animal Nutrition Research, Lilly Research Laboratories, Greenfield, Indiana.

Rumensin Research at KSU, Dr. Jack Riley Department of Animal Science and Industry, KSU.

Beef and Grain Outlook, Dr. Bill Helming, President, Livestock Business Advising Service, Kansas City, Mo.

12:15 p.m. Weber Hall Arena

Lunch: Roast Beef

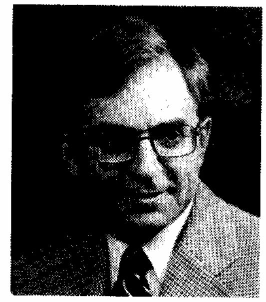
1:00 p.m. Weber Hall Arena

Remarks:
Rolland Parr, President, Kansas Livestock Association, Rossville, Kansas.

1:10 p.m. Introduction of Guest Speaker

Dr. Don L. Good, Head, Department of Animal Science and Industry, KSU.

"Buffalo to Beef and Beyond"
President Duane Acker, Kansas State University.



President Duane Acker

Dr. Duane Acker became the 11th president of Kansas State University, the nation's first land-grant university, on July 1, 1975. President Acker is a renowned teacher, researcher, author and administrator.

2:00 p.m. Beef Cattle Research Center

(about 2 miles north, at end of College Avenue)
Tour Stops at Beef Research Unit:

- Sources of Roughage in Finishing Rations
  Dr. Keith Bolson
- Crop Residues in Growing Heifer Rations
  Dr. Larry Corah
- Crop Residues in Beef Cow Rations
  Dr. Miles McKee
- Harvesting, Feeding, and Storing Milo Stover
  Prof. Gus Fairbanks
- Feeding Protein Based on Environment
  Dr. David Ames
- Feeding Newly Weaned Stressed Calves
  Dr. Bob Schalles
- Efficiency of Gain for Different Type Steers
  Dr. Mike Dikeman
- Estrus Synchronization of Beef Heifers and Cows
  Dr. Guy Kiracofe

FOR THE LADIES

THURSDAY, MARCH 4, 1976

6:30 p.m. Bluemont Room, KSU Union

Kansas Cow Belles Dinner (buffet)

Reservations by March 1 to:
Mrs. Don L. Good
2027 Sunnymeade Road
Manhattan, Kansas 66502
or phone 913 539-5176

FRIDAY, MARCH 5, 1976

9:30 a.m. Weber Hall, Staff Memorial Library

Ladies Coffee

11:00 a.m. Ladies Program, Weber Hall, Room 107

12:15 p.m. Weber Hall Arena

Lunch: Roast Beef

C O N T E N T S

Introduction

Domesticating animals permitted man to cease being purely a hunter and to adopt a settled mode of living. Without domestic animals, men would, of necessity, still be nomadic hunters. Livestock have long been man's most dependable friends and strongest allies in his task of adjusting to the world in which he lives. They nourish and reinforce man.

Livestock is a rich replenishable natural resource which provides a more abundant life for man and aid in using our natural resources more efficiently in ways that are environmentally acceptable. Meat and animal products are all rich in natural, complete proteins needed to build strong, healthy bodies and minds.

Beef is the most popular meat for consumers. Beef cattle are ruminants and can utilize pasture, range, waste land, crop residue and by-products of food manufacturing which can not be eaten by humans, and are not in competition with humans for food. Because of research, training and experience, the United States produces 26% of the world's beef but has only 9.2% of the cattle. In the United States, we have 333 million acres in growing crops. In the world, it is estimated that we have 3.5 billion acres in crops. In the United States, we have approximately 1 billion acres of range land and, in the world, we have 7.5 billion acres of range land. The American Forage and Grass Lands Council says that our 1 billion acres of forage-producing land is being used at only 22 percent of its potential. In the crops sector, for every acre harvested in crops, on the average, we have 1 to 1.5 tons of roughage produced on a dry matter basis that can only be utilized by ruminants, primarily beef cattle.

As we look back over the past 200 years, the beef animal has been a tremendous asset to this nation and, as we look ahead, the beef cattle industry is assured a bright future. Our industry is dynamic and changes will occur but beef cattle will continue to be important as a food and fiber producing animal for mankind as we learn to use our nation's resources in the most efficient way.

My biggest fear is that our government, the press, labor unions, and agri-businesses associated with food production, processing, and marketing are not concerned enough that the producer of food and fiber must have a fair profit. If this doesn't occur, our nation, as well as other nations, will suffer from dramatic food shortages.

The Animal Science and Industry Department staff is dedicated to serving the great livestock and meat industry of Kansas by training students, conducting meaningful research, and by extending this research to the people.

Don L. Good

Don L. Good, Head
Department of Animal Science
& Industry

Inducing Puberty in Beef Heifers with Hormones

Richard DeBenedetti, G. H. Kiracofe, Vicki Hultine,
R. M. McKee, and R. R. Schalles

Summary

Twenty-six Polled Hereford and Simmental-cross heifers that had not cycled by the beginning of the breeding season were given an ear implant and injected with an estrogen--progestogen compound. The implant was removed after 9 days and all heifers were in estrus 1 to 5 days later. Six heifers conceived the first insemination, 11 the second, and 24 during the 65-day breeding season.

Introduction

Some methods of synchronizing cattle have the ability to induce estrus in noncycling animals as well as to group estrus periods among cattle. Some heifers appear to be large and old enough to cycle but do not cycle by the beginning of the breeding season. We attempted to initiate cycling in such a group at a desired time with Syncromate (G. D. Searle Co.), an experimental estrus synchronization compound.

Experimental Procedure

Twenty-six yearling heifers that had not cycled were given a 6 mg ear implant of Syncromate, and one intramuscular injection of 3 mg SC21009 and 6 mg estradiol valerate. The implants were removed 9 days later. Heifers ranged from 374 to 460 days old (avg. 417) and weighed 510 to 957 lbs. (avg. 660). Ovaries were palpated six days before and at treatment to insure that they had not ovulated. Heifers were checked for estrus continuously from 6:00 a.m. to 10:00 p.m. and were artificially inseminated 18 to 26 hours after being observed in standing estrus. Each heifer showing estrus was bred artificially for at least two services then put with a bull. Conception was determined by rectal palpation.

Results and Discussion

The treatment was extremely effective; 25 of the 26 heifers were in estrus 24 to 72 hours after implant removal (table 1.1). Nine had repeated estrous periods after their first insemination, generally in estrus one day, out the next, then back in estrus again the next day. Estrous periods were repeated 1 to 4 times in the nine heifers. Some of them were inseminated only at the first estrus, some at each estrus, but none conceived until completing one normal cycle. The treatment was effective in inducing puberty; however, conception was low at first service (23.1%). Conception for the 65-day breeding season was as good as expected for cycling heifers (92.3%).

This treatment shows promise of being an effective way of initiating cycling in heifers as well as synchronizing estrus at the beginning of the breeding season. Additional work is needed to determine how young or how small heifers can be and still have puberty induced and to determine if breed and condition are important factors.

Table 1.1 Occurrence of estrus after hormone treatment in non-cycling heifers.

	AM	PM	AM	PM	AM	PM	AM	AM	TOTAL
Day[a]	1	1	2	2	3	3	4	5	
No. in estrus	11(3)[b]	10(1)	2	0	2(1)	0	0	1(1)	26(6)
Conceived 2nd service[c]	2	7	1	0	1	0	0	0	11
Conceived after 2nd service	5	1	1	0	0	0	0	0	7

[a]AM day 0 was time implant was removed

[b]No. heifers conceiving on first service in ( ).

[c]No. of heifers showing estrus at this time after treatment and that conceived on second cycle.

Synchronizing Estrus in Beef Heifers with Prostaglandin and Syncromate B

R. C. DeBenedetti, G. H. Kiracofe, V. Hultine, R. M. McKee and R. R. Schalles

Summary

Forty-five of 50 heifers were in estrus 1 to 5 days after 7-day synchronization implants were removed. Prostaglandin was injected one day before implants were removed. Thirty-one of the 45 (68.9%) heifers conceived to first artificial insemination service.

Introduction

We have previously reported that an ear implant (Syncromate B, G. D. Searle Co.) for 7 days followed by intramuscular injection of prostaglandin $F_{2\alpha}$ (PGF, The UpJohn Co.) synchronized estrus with no affect on conception rates in beef heifers. Heifers with a corpus luteum on the ovary when the PGF was injected showed estrus 12-24 hrs. later than those with no corpus luteum. The injected PGF is to regress the corpus luteum to allow estrus; we thought injecting the PGF one day before removing the implant would more closely synchronize estrus than previously reported.

Experimental Procedure

Fifty cycling heifers were implanted in the ear with Syncromate B, a synthetic progestogen that prevents estrus. Six days later each heifer was injected with 33.3 mg. of prostaglandin THAM salt. One day later we removed the implant. Heifers were checked frequently during the day for estrus and were artificially inseminated 12 to 24 hours after estrus was first detected. Conception rate was determined by rectal palpation.

Results and Discussion

Forty-one of the 50 heifers were in estrus in a three-day period and 45 of 50, in a five-day period; 31 of the 45 (68.9%) conceived the first insemination; 41 of the 45 (91.1%) conceived in two inseminations.

Five heifers not synchronized exhibited estrus within the next five days. Four of the 5 conceived with first service. Conception rate for the 50 heifers for the entire 65-day breeding season was 94%.

These results do not differ from those previously reported when prostaglandin was given when the implant was removed.

This procedure resulted in approximately 90% of cycling heifers showing estrus in a five-day period, and conception rates were the same as for nonsynchronized heifers.

Table 2.1 Occurrence of estrus and conception rates in heifers treated with Syncro-mate B and prostaglandin

	Days post treatment[a]										
	AM 1	PM 1	AM 2	PM 2	AM 3	PM 3	AM 4	PM 4	AM 5	PM 5	Total
No. in estrus	6	19	3	10	0	3	0	3	1	0	45[b]
No. conceived 1st service	5	12	3	6	0	3	0	1	1	0	31

[a] Implant removed AM day 0.

[b] Five of 50 heifers showed no signs of estrus during the 5 days, four of the 5 later conceived with first service.

Flushing Cows

R. R. Schalles, Guy Kiracofe, E. F. Smith

Summary

Starting to flush cows 95 days before the breeding season began significantly increased conception rate and required less total feed.

Introduction

Flushing ewes and sows before breeding has been a standard practice for years. It increases twining in sheep and litter size in swine. Flushing cows has the same effect by increasing conception rate. Work reported in the 1974 Cattlemen's Day Report (Kansas Ag. Expt. St. Report of Progress 210) indicated flushing cows gives an economic advantage.

Experimental Procedure

We used spring-calving Polled Hereford cows in a two-year flushing study involving 120 cow years. One group received 3 lbs. alfalfa hay and 3 lbs. cracked sorghum grain from early November to late April. The other, 3 lbs. of a range cube that was half dehydrated alfalfa and half cracked sorghum grain the first part of the winter. February 15 (95 days before the breeding season began) the cubed ration was doubled to 6 lbs. per head daily. Breeding season was 66 days.

Cows were pastured on native Bluestem all year. Conception was determined by rectal palpation and daily estrus checks during the breeding season. Cows and calves were weighed monthly and calves were weaned in early October.

Results and Discussion

Cow weight changes, calf birth and weaning weights and average date of conception were similar in both groups (table 3.1). However, flushed cows had 15% higher conception rate on 34 lbs. less crude protein and 183 lbs. less TDN during the wintering period. Flushing decreased the percentage of open cows regardless of how early the cows calved. However, flushing's greatest contribution was improving conception rate of cows calving late.

Table 3.1 Effects of flushing on reproduction of beef cows (1974-75)

Indicated factor	Continuous feeding	Flushed
No. observations	51	78
Ration Nov. to Feb. 15		
CP per day (lb.)	0.83	0.46
TDN per day (lb.)	4.05	2.17
Ration Feb. 15 to April 20 (64 days)		
CP per day (lb.)	0.83	0.92
TDN per day (lb.)	4.05	4.34
Total feed per cow		
Alfalfa hay (lb.)	513	
Dehydrated Alfalfa (lb.)		352.5
Sorghum grain (lb.)	513	352.5
CP (lb.)	142.1	108.1
TDN (lb.)	693	510
Cows'		
Oct. wt. (lb.)	989	987
Dec. wt. (lb.)	938	970
Feb. wt. (lb.)	928	925
May wt. (lb.)	845	789
Sept. wt. (lb.)	1012	991
Calves'		
Birth wt. (lb.)	74	76
Weaning wt. (lb.)	451	461
Cows'		
Conception rate (%)	78.4	93.6
Conception date	June 17	June 17

Synchronization of Estrus in Beef Cows

Margaret Heekin, G. H. Kiracofe, V. Hultine,
R. R. Schalles, and R. M. McKee

Summary

We used 79 cows to evaluate Syncromate B (G. D. Searle, Co.) as an estrus-synchronizing agent. Management of five groups of cows was: (1) nonsynchronized, bred naturally; (2) nonsynchronized, bred artificially; (3) synchronized, bred naturally; (4) synchronized, bred artificially at estrus; and (5) synchronized, bred artificially 60 hours after implant was removed. Conception rates were not affected by artificial breeding or synchronization. However, not all cows synchronized showed estrus. Percentages of cows bred during the first 25 days of the breeding season were 72.2, 71.4, 84.6, 68.7, 83.3 for groups 1 through 5, respectively.

Introduction

Syncromate B is the trade name for an experimental compound developed by G. D. Searle Co. to synchronize estrus in cattle. Last year we reported good synchronization with it; however, conception rates were low in cows inseminated when detected in estrus or at an appointed time after removing the implant. The low conception could have resulted from artificial insemination or the synchronization procedure, so this year we included more comparisons. Although conception is sometimes low after synchronization, benefits may be higher percentages of cows conceiving early in the breeding season and shortening the artificial breeding period to 25 days with each cow having two chances to breed.

Experimental Procedure

Seventy-nine Polled Hereford cows 45 to 90 days post-partum were divided into five breeding groups: (1) nonsynchronized, bred naturally; (2) nonsynchronized, bred artificially; (3) synchronized, bred naturally; (4) synchronized, bred artificially at estrus; and (5) synchronized, bred artificially 60 hours after removing implant. All cows were lactating and ovaries of some were palpated to confirm cycling.

All cows in the synchronized groups were given a 6mg. SC21009 ear implant. At the time of implantation, cows were injected intramuscularly with 6 mg. of estradiol valerate and 3 mg. SC21009 (a synthetic progestogen). Nine days later the implants were removed. Checks for estrus were made twice daily and cows in group 4 were bred artificially approximately 12 hours after estrus was detected. Cows in group 5 were artificially bred 60 hours after implants were removed without regard to estrus. Groups 4 and 5 were placed with bulls equipped with chin-ball markers 6 days after implants were removed. Group 3 was placed with five bulls after implants were removed and were allowed to mate naturally.

The nonsynchronized cows in group 1 were placed with a marker bull and allowed to mate naturally. Cows in group 2 were checked twice daily for estrus for 21 days and artificially bred approximately 12 hours after estrus was detected. After the 21-day artificial breeding period, a bull was placed with the cows.

Bulls were removed after a 55-day breeding season (including AI). All cows were kept on range for the duration of the experiment. Pregnancy was determined by rectal palpation.

Results and Discussion

First service conception did not differ between nonsynchronized cows bred artificially or naturally, 71.4 and 72.2%, respectively. Also, first conception rate was the same in synchronized cows whether bred naturally (69.2%) or artificially (66.7%). First service conception was lower in cows synchronized and bred 60 hours later (38.9%). Neither synchronization nor artificial insemination depressed conception rate when cows were bred according to estrus (table 4.1).

Four of 16 cows in group 4 did not show estrus during the five-day synchronization period. Considering only the cows bred, 8 of 12 (66.7%) conceived on first insemination, not different from the first three groups. Only 29% of group 5, bred artificially 60 hours after implant was removed conceived on first service; however, time of insemination in relation to estrus may have been incorrect for optimum conception. Eighteen cows were in the group: 4 were not detected in estrus, 1 conceived; 2 were first detected in estrus at breeding time--both conceived; 4 were in estrus 12 hours before breeding--2 conceived; and 8 were in estrus 24 hours before breeding--2 conceived. Insemination apparently was too late for good conception rates.

This experiment showed promise for estrus-synchronizing agents. Although conception percentage for cows in the timed-inseminated group was low, a higher percentage conceived during the first 25 days than in nonsynchronized groups. Also, 39% of the cows were bred artificially with minimum effort. Conception not being greatly reduced by synchronization in cows showing estrus suggests that insemination by appointment at the proper time in relation to ovulation may be possible.

Table 4.1 Conception rates in cows after estrous synchronization

Group	No. of cows	% conceived synchronized period	25 days	55 days
Nonsynchronized, bred naturally	18	--	72.2	88.9
Nonsynchronized, bred artificially	14	--	71.4	71.4
Synchronized, bred naturally	13	69.2	84.6	84.6
Synchronized, bred artificially	16	50.0[a]	68.7	87.5
Synchronized, bred AI at 60 hours	18	38.9	83.3	88.9

[a]Four cows did not exhibit estrus during the 5-day synchronization period. Of those bred, 66.7% conceived.

Inheritance of Some Reproductive Traits by Young Bulls

J. H. Warren, J. Blum, R. R. Schalles, G. Kiracofe
K. Henry and V. Hultine

Summary

Several reproductive traits of yearling Polled Hereford bulls were evaluated during and immediately after a 140-day feeding test. Results indicate that concentration of sperm and percentages of live sperm are heritable and genetically independent of each other. Heribility was low for sex drive or libido.

Experimental Procedure

Seventy-two Polled Hereford bulls on a 140-day feed test at the KSU Beef Research Center in 1974-75 were used in this experiment. Beginning when they were approximately eight months ago, we observed each bull for five minutes every four weeks and recorded the bull's sexual behavior with an ovarectomized heifer in standing estrus. Sex drive or libido was measured as the bull's age in days when he first successfully mounted the heifer, penetrated, and ejaculated. Semen from each bull was collected by electroejaculation when they were approximately 12½ months old after the 140-day test. Concentration and percentage of live sperm were recorded.

The data were analyzed by least squares procedures. Sire and barn were held constant. Heritabilities and genetic correlations were calculated using patenal half-sib method.

Results and Discussion

Means, heritabilities, and genetic correlation for the traits are given in table 5.1. Both concentration and percentage of live sperm were significantly affected by sire ($P<.05$). However, sex drive had little sire influence.

Bulls with more libido (younger at first successful service) tended to have semen with higher concentrations of sperm, but lower percentages of live sperm. Percentage of live sperm and concentration have only a small positive genetic relationship. High heritabilities for concentration and percentage of live sperm make them traits that could be successfully selected for in a breeding program.

Table 5.1 Means, heritabilities and genetic correlations of reproductive traits.

Trait	Mean	Heritabilities (on diagonal) and genetic correlation (off diagonal)		
		Libido	Concentration	%Live
Libido[a]	382 days	.14		
Concentration[b]	33.7 x 10	-.63	.81	
Live sperm (%)	58.6	.69	.13	.95

[a]Libido is measured as age (in days) at which bull first successfully serves a female.

[b]Sperm per cc of semen.

Effects of Inbreeding on Postweaning Performance of Shorthorn Beef Cattle

M. H. Hall, W. H. Smith, and R. R. Schalles

Summary

Two inbred lines of Shorthorn beef cattle were established during 1950 to evaluate inbreeding. Analyses of postweaning production data for the first four generations of inbreeding indicate that inbreeding in calves depresses yearling type score, average daily gain, and weight per day of age, but not feed efficiency. The growth depression effects were relatively minor, however. Inbreeding in dams of the calves did not significantly affect any of those traits.

Observations to date indicate that mild inbreeding will not cause fitness traits to deteriorate in beef cattle.

Experimental Procedure

The Wernacre Premier and Mercury inbred lines of Shorthorn cattle were established in 1950. Both have remained closed to outside breeding since then and have been maintained and developed by inbreeding. The first four generations of postweaning production data were analyzed for this study.

The postweaning production performance for all calves consisted of a 182-day individual feeding period on high concentrate rations. The average initial age at the start was 200 days or approximately 20 days after weaning. Average daily gain, TDN consumed per pound of gain, yearling weight per day of age, yearling type score, and coefficient of inbreeding[1] were measured for all calves. Inbreeding by dams of calves was included in the analyses.

Three hundred eleven calves, including 117 from repeat matings, were used in the statistical matrix of within-mating-type relationship in a weighted analyses to determine environmental (year) effects. Average annual inbreeding coefficients of calves ranged from 0 to 38% within lines with an overall average of 15.8%. The rate of inbreeding-increase has been approximately 1% per year or 4.5% per generation interval.

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1 Coefficient of inbreeding estimates increased genetic homozygosity resulting from the mating of related parents. The offspring of half-sibs are 12.5% inbred and those of full-sibs 25% inbred. The amount accumulates with successive generations of practice.

Intensity of selection averaged 14% for bulls and 57% for heifers. Selection differences for production traits were appreciably higher among bulls.

Results and Discussion

Inbreeding of calf significantly depressed yearling score, yearling weight-per-day-of-age, and average daily gain during the postweaning performance period. Partial regression coefficient of inbreeding of calf revealed that a 10% increase in inbreeding reduced yearling type score -.350 point (1/9 of a grade), weight per day of age -.031 lb., and test average daily gain -.035 lb. It did not significantly depress feed efficiency.

Inbreeding of cow had no significant effect on any of the traits studied. The quadratic term for both the effects of inbreeding of calf and dam were not significant so inbreeding effects are linear. Results are summarized in table 6.1 .

Conclusions

1. Inbreeding possessed by calves causes moderate decline in yearling type score, weight per day of age, and postweaning average daily gain. It does not depress feed efficiency.

2. Inbreeding of dam has not significantly affected postweaning performance of their calves.

3. Inbreeding no higher than reported here may be practiced without deteriorating fitness traits in beef cattle.

4. Some inbreeding is essential in nearly all constructive selection programs.

Table 6.1 Partial regression coefficients per 10% increment of inbreeding (F) on performance of calves.

	F of Calf	F of Dam
TDN gain	.009 P<.67	-.001 P<.95
Type score	-.350** P<.002	-.058 P<.56
Test avg. daily gain	-.035* P<.054	.024 P<.14
Weight per day of age	-.031** P<.005	.004 P<.61

* P<.05 and ** P<.01

Cow and Calf Performances as Affected by Fertilizing and Burning Bluestem Pastures

Don Boggs, R. R. Schalles, C. E. Owensby,
L. H. Harbers, and E. F. Smith

Summary

Burning and fertilizing Bluestem pastures were evaluated by comparing performances of spring-calving cows and calves that grazed them. Two control pastures were not burned or fertilized; two pastures were burned; and two were burned and fertilized with 40 pounds of nitrogen an acre, applied aerially. Neither average daily gains of the calves nor reporductive performance of the cows differed significantly among treatments, but more pounds of calf were weaned per acre from pastures burned and fertilized.

Introduction

Economic conditions in the beef industry are forcing producers to find ways to improve the productivity of native range to reduce production costs. Fertilizing has long been used to increase crop production, but the results have been less favorable on native range. Fertilizing pasture has been limited because it tends to increase weeds and cool-season grasses, is difficult to apply, and has not proved economically feasible.

Late-spring burning has been shown to reduce weeds and cool-season grasses on Flint Hills range. Therefore, we are studying fertilizing and burning separately and in combination to see if they complement each other and can be used to increase productivity of Bluestem grass and performance of animals grazing it.

Experimental Procedure

This study started in the fall of 1971 with Polled Hereford cows assigned to three pasture treatments. Cows that died, were unsound, or failed to calve, have been replaced.

One Polled Hereford bull was placed in each pasture from May 24 to July 25. Calves were weaned October 9, 1975, at an average age of 196 days.

All pastures have been treated the same the last three years. April 22, four of the six pastures were burned. April 29, ammonium nitrate (34% nitrogen) was applied aerially at 40 lbs. of nitrogen per acre to two burned pastures. The first week of every month the cows and calves were gathered and weighed, after being penned without feed or water overnight.

Results and Discussion

Burning or burning plus fertilizing did not significantly affect weaning weight of calves or performance of cows, but significantly increased pounds weaned per acre--through heavier stocking rates, not increased daily gains.

Table 7.1 Effects on cow and calf performance of burning and fertilizing native bluestem pastures, 1974-1975.

	Control (two pastures)	Burned (two pastures)	Burned and fertilized (two pastures)
not same throughout			
Cows per treatment	23	26	30
Average cow wt., lb.			
Dec.	1009	988	1006
Feb.	962	952	952
May July	828	804	797
Sept. Nov	1025	1016	1019
Acres per cow	7.1	7.1	5.6
Supplemental feed [1], av. per cow daily,			
Nov. 1 to Feb. 15	3.0	3.0	3.0
Feb. 15 to April 20	6.0	6.0	6.0
Avg. calving date	3-30	3-31	3-24
Calf birth wts.,[2] lbs. Calf july wt	75.8	78.2	74.7
Number calves weaned	19	23	25
Avg. breeding date	6-13	6-17	6-14
where do get this? Conception rate, percent	96	92	100
are they adj yet Adjusted weaning wt., lbs.	491	464	479
Pounds weaned per acre (adjusted how many ac.	57	58	71

[1] Cubed compound of 50% dehydrated alfalfa and 50% ground sorghum

[2] Adjusted for cow age, calf sex, birth date, birth weight

Response of Yearling Steers to Burning and Fertilizing Pasture and Intensive Early Season Stocking (Bluestem Pastures)

Don Boggs, L. H. Harbers, R. R. Schalles, C. E. Owensby, and E. F. Smith

Summary

Nine pastures totaling 492 acres were summer grazed by yearling Hereford, Hereford-Angus cross, and Angus steers distributed equally by breed. Five pastures were burned April 22, 1975; four were not burned. Burned and nonburned pastures had 0, 40, or 80 lbs. of nitrogen per acre applied aerially April 29, 1975. Stocking rates were determined with herbage production data from experimental plots under similar treatments. Under equal fertilization and stocking ratios, burned and fertilized pastures produced as much or more average daily gain and more gain per acre than nonburned pastures. Fertilizing and heavier stocking tended to reduce average daily gains but increased gains per acre. Steers on the early season, intensely-stocked pasture gained the most per day (1.78 lbs.) and produced the highest gain per acre (70 lbs.).

Introduction

Native bluestem grasses have long provided a major part of the forage for Flint Hills beef producers. Late spring burning (late April) has increased steer gains and improved range conditions. Nitrogen fertilization has improved both the quantity and protein content of the forage produced, but also has increased cool-season grasses and weedy species in the pastures. The treatments explained, used separately and in combination, are to evaluate their effects on beef production and range condition. Effects of early-season, intensive stocking on a burned pasture also are being studied.

Experimental Procedure

Nine native bluestem pastures, totaling 492 acres, four miles northwest of Manhattan were used in the study. All treatments were the same as the previous three years. One burned, nonfertilized pasture, and one nonburned, nonfertilized pasture have had the same treatment the last 25 years, to study long term effects. Burned pastures were burned April 22, and ammonium nitrate (34% nitrogen) was applied aerially April 29. Pastures grazed the entire summer season were stocked from May 2 to October 2. The intensively grazed pasture was stocked from May 2 to July 15. All were stocked with Hereford, Hereford-Angus cross, and Angus steers averaging 553 lbs. and equally distributed among the pastures. One-third of the steers were implanted with Ralgro, one-third with Synovex-S, and a third with Stilbestrol (30 mg.) before being placed on pasture. All were gathered the first of each month, penned overnight without feed or water, and weighed the next morning.

Results and Discussion

Late spring burning tended to increase daily gain and gain per acre (table 8.1). Nitrogen at 40 or 80 lbs. per acre tended to reduce daily gain, but increase gain per acre. The pastures receiving nitrogen probably were stocked too heavily for maximum long range productivity. The intensively-stocked pasture produced the highest average daily gain.

Differences in average daily gain among steers implanted with Ralgo, Synovex-S, or Stilbestrol (30 mg) were not significant.

All burned pastures had better range condition than unburned pastures. Pastures not burned had high amounts of Kentucky Bluegrass and western ragweed. Carbohydrate reserves were much higher on burned than on non-burned pastures. The highest range condition was in the intensive, early-stocked pastures.

Table 8.1 Effects on steer gains from burning and fertilizing native bluestem pasture, May 2 to October 2 (153 days), 1975.

	Daily gain per steer, lbs.	Gain per acre, lbs.	Acres per steer
Not burned			
No nitrogen, same treatment 25 years	1.17	48	3.8
No nitrogen	1.17	48	3.8
40 lb. nitrogen per acre	.96	54	2.7
80 lb. nitrogen per acre	.90	57	2.4
Burned April 22			
No nitrogen, same treatment 25, years	1.40	58	3.7
No nitrogen	1.18	48	3.8
40 lb. nitrogen per acre	1.16	69	2.6
80 lb. nitrogen per acre	.95	63	2.3
Intensively stocked May 2 to July 15 (74 days)	1.78	70	1.9
Normal stocked May 2 to July 15 (74 days)	1.58	31	3.8

Effects of Growth Promoting Implants on Gains of Nursing Calves

Larry Corah, J. G. Riley, K. Kimple, M. McKee

Summary

Both steer and heifer calves gained significantly (P<.05) faster on summer pasture with growth-promoting implants than calves not implanted. Ralgro, Synovex-S, and Synovex-H were tested, with no significant advantage for one implant type.

Introduction

Because the availability of DES is uncertain, we evaluated--Synovex-S, Synovex-H, and Ralgro, all DES alternatives, for promoting growth of suckling calves.

Experimental Procedure

Eighty spring steer and heifer calves were divided into three groups for the tests. Calves nursed their mothers the summer of 1975 while grazing on native grass near Manhattan. The growth promoting products were implanted the week before cattle went to grass. They consisted of the standard Synovex-S[a] and Synovex-H[a] (for steers and heifers, respectively) and 36 mg. of Ralgro[b] (used in both steers and heifers). Control calves were not implanted. Thirty Hereford steers, 25 Hereford heifers, and 25 part Simmental heifers were studied. Allotments to treatments are listed in table 9.1.

All calves were weighed May 2 and put on grass May 3. Calves were weaned from their mothers and weighed November 14. Weight gains for the summer were for 194 days (May 2 to November 14).

Results and Discussion

Steers implanted with Ralgro and Synovex-S gained significantly more (P<.05) than control steers (table 9.1). Similarly, heifers implanted with Synovex-S and Ralgro gained significantly (P<.05) more than control heifers. There was no significant difference between calves implanted

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[a] Synovex-S and Synovex-H provided by Myzon Laboratories, Inc., Des Moines, Iowa.

[b] Ralgro provided by Commercial Solvents Corp., Terre Haute, Ind.

with Ralgro or Synovex. Implanted steers had a 34 lb. gain advantage over the control steers and implanted heifers, a 17 lb. advantage over control heifers.

Trial results compare favorably with work at other stations testing implant performances.

Table 9.1 Gains by nursing calves implanted with indicated products, May 2 - Nov. 14, 1975.

Implant	No. of animals		Average heifer gain, lbs.	Average steer gain, lbs.	Difference between control & implanted			
					Heifers		Steers	
	Heifers	Steers			lbs.	%	lbs.	%
Control	16	10	270.1	232.4	---	---	---	---
Ralgro[1]	16	11	287.7	265.6	17.6	6.5	33.2	14.3
Synovex[2]	18	9	287.2	268.4	17.1	6.3	36.0	15.5

1 36 mg. Ralgro for both steer and heifer calves.

2 Heifer calves received Synovex-H.
Steer calves received Synovex-S.

Response of Yearling Steers on Bluestem Pasture to Ralgro, Synovex S and Stilbestrol Implants

Don Boggs, J. G. Riley and E. F. Smith

One hundred seventy-five Hereford, Hereford-Angus cross and Angus steers, averaging 553 lbs., were distributed as equally as possible by breed among four pastures. The pasture season was May 2 to October 5, 1975 (152 days). A third of the steers in each pasture were implanted with one of the three following materials: Ralgro, Synovex S, Stilbestrol (30 mg.). There was no significant difference in gains by the groups. Previous research has shown that Stilbestrol implants increase weight gains of steers on bluestem pasture 10 to 15 percent.

Table 10.1 Daily gain of Steers on Pasture Implanted different ways

Implant treatment	Number of steers	Average daily gain
Stilbestrol	49	1.04
Synovex-S	45	1.10
Ralgro	49	1.10

Adjusting Protein in Cattle Rations During Cold Weather[1]

D. R. Ames

Summary

Two winter trials have indicated that protein can be removed from growing rations during cold weather without lowering average daily gain. Cattle consumed 0.29 and 0.33 lb/hd/da (0.11 and 0.15 kg/hd/da) less protein supplement (soybean oil meal) during winters 1975 and 1976, respectively.

Introduction

Exposure of feedlot cattle to effective temperature below the animal's thermal neutral zone (TNZ) increases net energy it needs for maintenance (NEm). Increased intake during cold weather does not fully compensate for increased NEm, so available net energy for growth (NEg) is lowered. Consequently, when protein percentage in rations is constant during cold weather protein efficiency (g protein/g gain) is reduced. Logically, protein efficiency could be improved by matching protein in the ration to gain during cold. Previous work shows that mean daily temperature (MDT) can be used to predict average daily gain (ADG).

Procedures

Two trials were conducted to test the idea that protein could be adjusted during cold without affecting gain. During winter 1974-75, 200 steers were fed protein levels adjusted for cold, while 200 control steers were fed a 12.5% crude protein ration. In winter 1975-76 a 2x7 factorial design was used to compare constant protein ration with adjusted-protein rations. Protein adjustments were based on lowered ADG expected during cold weather. The formula, gain = 1.396 + 0.013 C where gain is kilogram and C is temperature in degrees centigrade was used to predict gain during cold. That equation was derived from data involving approximately 40,000 steers fed outdoors in Kansas. Protein for growth (protein above maintenance being $2.79W^{0.75}$ gram) was adjusted according to the expected effect of temperature on gain. For example, when gain was predicted to be lowered 25%, then, protein for growth was reduced 25%. All protein adjustements were made by replacing protein supplement (SBM) with milo so that rations would contain the same calories as with SBM. No attempt was made to lower protein more than removing all supplement.

[1] Supported by Fourth National Bank of Wichita through Livestock and Meat Industry Council.

Results and Discussion

Both years ADG did not differ ($P < .05$) between steers consuming a constant-percentage-protein and those receiving protein adjusted for expected lower ADG during cold. Steers ate 0.29 and 0.33 lb/hd/da (0.11 and 0.15 kg/hd/day) less protein supplement (SBM) for the trial 1 and trial 2, respectively (table 11.1). It must be emphasized that protein removal is limited to supplemental protein feedstuffs and that some rations contain more protein than needed during severe cold. Practically, it is not feasible to remove protein beyond that included in supplemental protein.

Adjusting protein is more important in growing rations than in finishing rations because lean tissue deposition is greatest during earlier stages of growth. Consequently, both trials involved growing rations and relatively light cattle, 475 and 670 lbs. (215 kg and 303 kg) initial weight for trial 1 and 2, respectively.

The idea of altering rations to match environment is a relatively new concept which should maximize efficiency by reducing feed cost. Adjusting protein will improve protein efficiency (grams gain/grams protein intake) because excess dietary protein for growth is withdrawn instead of being used as a source of energy during cold. The technique of altering rations to match environments will be refined as more is learned about environmental effect on animal performance.

Table 11.1 Effect of adjusting protein to expected ADG of growing steers.

Trial	% Crude Protein	ADG (lb)	SBM Removed lb/hd/da
Control 1 (117 days)	12.5	2.07 (0.99 kg)	0
Adjusted 1 (117 days)	variable	2.06 (0.99 kg)	0.29 (0.11 kg)
Control 2 (87 days)	11.9	2.39 (1.06 kg)	0
Adjusted 2 (87 days)	variable	2.93 (1.10 kg)	0.33 (0.15 kg)

Feedlot Performance by Month in Kansas

D. R. Ames

Summary

Feedlot data on 202 lots involving approximately 40,000 steers collected for five years were used to characterize feedlot performance each month of the year. Intake, average daily gain (ADG), and feed efficiency were measured. ADG was predicted for mean daily temperature (MDT).

Introduction

Performance of feedlot cattle is affected by both heat and cold. When effective temperature rises above (heat stress) or falls below (cold stress) the thermal neutral zone (TNZ) average daily gain is reduced and feed to gain ratio increases. It takes more feed to meet increased maintenance requirements during thermal stress (heat or cold) and so less feed energy is available for growth. Net energy equations used to predict ADG do not include the effect of temperature. Accurate prediction of performance at different temperatures would allow feeders to adjust rations for specific thermal environments.

Procedure

We used five years of weather, feed, and growth records involving approximately 40,000 steers to determine the relationship between mean daily temperature and performance. All cattle were steers of similar type (Okie No.1) and size (mean weight 992±103 lb. or 450±47kg). Because all cattle were slaughtered in the feeder's plant, results were not affected by holding cattle for improved markets, etc. Temperature was monitored with a bimetallic type thermograph. Feed (Kcal ME 2.13/g) was weighed and recorded daily. Weigh periods ranged from 30 to 46 days with data from animal's first weighing not used. When data are presented by month, they refer to month the weigh period ended.

Results and Discussion

Voluntary intake per unit of metabolic size varied most during cold and least during heat (Table 12.1). The variations were as expected, but were not different ($P<.05$) when analyzed.

ADG's were significantly ($P<.05$) affected by temperature and are listed by month in Table 12.1. Highest ADG's were in fall and spring with depressed ADG during winter and summer. Plotting ADG as a function of mean daily temperature (range 26 to 86F or -3 to 30C) gave a quadratic relationship. Maximum performance was at 59F (15C). However, when temperature below 59F (15C) is treated separate from temperature above 59F (15C) a linear effect of temperatures on ADG is found during cold and a quadratic effect during heat. During cold weather, maintenance increases are linear with maximum intake; during hot weather maintenance is non-linear and feed intake decreases. It must be mentioned that thermal effects depend on acclimation by the steers. Pooled data presented here do not remove that effect.

Feed efficiency differs significantly ($P<.05$) with temperature and is shown by month (Table 12.1). Feed to gain ratio is inversely related to ADG as expected. Feed efficiency is poorest during cold and heat and best during spring and fall, when temperatures are neither cold nor hot.

Table 12.1 Intake, ADG, and feed efficiency by month of year for 40,000 steers finished in an open feedlot during 5 years

Month[1]	Intake ($ME/W^{.75}$)	ADG lb	ADG (kg)	F/G[2]
Jan.	271.8	2.91	(1.32)	9.2
Feb.	243.2	2.91	(1.32)	9.2
Mar.	241.1	2.91	(1.32)	8.1
April	246.4	2.93	(1.32)	8.5
May	255.8	3.15	(1.43)	8.1
June	256.9	3.11	(1.41)	8.2
July	249.1	2.87	(1.30)	8.8
Aug.	245.2	2.67	(1.21)	9.1
Sept.	243.0	2.98	(1.35)	8.4
Oct.	261.4	3.18	(1.44)	8.0
Nov.	264.9	3.48	(1.58)	7.7
Dec.	270.8	3.51	(1.59)	7.4

[1]Month refers to month steers were weighed and includes the preceding 30 to 46 days.

[2]Pounds of feed per pound of gain

Forage and Grain Yields of Wheat and Barley

Keith Bolsen, Larry L. Berger and Walt Moore[1]

Experimental Procedure

Our objectives were to determine the effects of variety and stage of plant growth at harvest on forage and grain yields of wheat and barley.

Plots were grown at the Animal Science and Industry Farm near Manhattan in 1973-74 and 1974-75 and at the South Central Kansas Experiment Field at Hutchinson in 1974-75. Hard red winter wheat varieties used were Parker, Eagle and Sage; soft red winter wheats were Arthur-71 and Blue Boy II. Three winter barley varieties were Paoli, Jefferson and Kanby. All cereals were harvested for forage in boot, milk and dough stages of plant growth and each treatment was replicated four times. A 60-sq.-ft. area was mower-clipped from each plot at each stage of growth to measure forage yields. Approximately 1 to 2 inches of stubble remained. A 12-sq.-ft. area was taken to determine grain yield.

Results

Hand harvesting plots gave higher yields than would be possible by machine harvest.

Wheat and barley forage and grain yields are shown in table 13.1. Forage yields are expressed as tons of 60% moisture forage per acre; grain yields are bushels of 15% moisture grain per acre.

Wheat and barley had similar forage yields. As stage of plant growth advanced from boot to dough, forage yields increased. At Manhattan, two-year, average dough stage yields were 75 and 77% higher than boot-stage yields for wheat and barley, respectively. Also at Manhattan, forage yields tended to be higher in 1974 than in 1975.

In 1974, severe lodging in both barley varieties reduced their grain yields. At both locations in 1975, barley grain yields were higher than wheat grain yields.

With two exceptions, variety of wheat or barley had very little affect on forage or grain yields. At Manhattan in 1974, soft red winter wheats yielded more grain than hard red winter wheats. In 1975, Paoli barley yielded less forage than Kanby barley.

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[1]Department of Agronomy

Table 13.1 Forage and Grain Yields of Wheat and Barley Harvested at Indicated Growth Stages.[a]

Location, year and variety	Forage yield, tons/acre[b] Boot	Milk	Dough	Grain yield, bu./acre[c]
		Wheat		
Manhattan, 1974				
Arthur-71	6.9	14.9	14.7	84.4
Blue Boy II	7.5	14.6	14.7	85.8
Parker	7.8	12.9	13.9	56.0
Eagle	7.2	12.3	13.7	54.8
Manhattan, 1975				
Arthur-71	6.2	8.9	10.1	62.8
Blue Boy II	6.6	10.1	10.1	65.7
Hutchinson, 1975				
Arthur-71	---	---	7.6	47.8
Blue Boy II	---	---	9.3	50.2
Eagle	---	---	9.4	45.4
Sage	---	---	9.4	45.4
		Barley		
Manhattan, 1974				
Paoli	8.8	12.8	14.3	81.2
Jefferson	8.2	13.0	14.9	82.1
Manhattan, 1975				
Paoli	4.5	7.6	7.9	95.3
Kanby	5.6	8.9	10.4	90.4
Hutchinson, 1975				
Paoli	---	---	8.5	83.0
Kanby	---	---	9.3	81.2

[a] Each value is the mean of four plot observations.

[b] Adjusted to a 60% moisture basis.

[c] Adjusted to a 15% moisture basis.

Wheat, Barley and Corn Silage Rations and Urea for Growing Steers

Keith Bolsen and Jack Riley

Summary

Eight rations were fed to 15 yearling steers (3 pens of 5 steers each). Arthur wheat, Paoli barley and corn silages were supplemented with either soybean meal or urea; Blue Boy II and Eagle wheat silages were supplemented with soybean meal.

All steers were full-fed a 12.5% crude protein ration containing 86% silage and 14% supplement. Results of the 84-day trial show steers fed the four corn and barley silage rations gained faster and more efficiently than those fed wheat silages. Steers fed Arthur and Eagle silage rations performed similarly. Those fed Blue Boy II silage made the slowest and least efficient gain. Steers receiving urea performed similarly to those receiving soybean meal.

Introduction

Two years research at this station (Prog. Rpt. 210, Kan. Agr. Expt. Sta., 1974 and Prog. Rtp. 280, Kan. Agr. Expt. Sta., 1975) evaluating high-silage growing rations has shown: (1) soft red winter wheat silages superior to hard red winter wheat silages; (2) barley silage superior to wheat silages and (3) corn silage superior to barley silage.

In general, protein contents of wheat and barley silages are higher than corn or sorghum silages, so less supplemental protein is needed with wheat or barley silage. Can urea be used to provide the protein without lower animal performance? When urea is fed with corn silage growing rations, rate and efficiency of gain are lower than when soybean meal is the supplemental protein.

Objectives of this year's trial were to (1) repeat comparisons of hard red and soft red winter wheat silages, (2) determine the relative feeding values of wheat, barley and corn silages and (3) evaluate urea as a source of supplemental nitrogen for wheat, barley and corn silage rations.

Experimental Procedure

Whole-plant wheat and barley forages were harvested and ensiled in the dough stage between May 28 and June 18, 1974. Varieties were Paoli barley (awned, winter), Arthur and Blue Boy II wheats (awnless, soft red winter) and Eagle wheat (awned, hard red winter). All forages were direct-cut with a self-propelled forage harvester equipped with a 15-foot cutter bar and a two-inch recutter screen. Water was added to the forages at the silo blower to maintain moisture at about 65 percent in the 10x50 ft. concrete stave silos. Corn with an estimated grain yield of 125 bu. per acre was harvested in the dent stage and ensiled in a 14x60 ft. concrete stave silo.

One hundred five yearling Hereford steers averaging 589 lbs. were used in the 90-day trial (October 11, 1974 to January 9, 1975). Three pens of five steers were randomly assigned to each of the following eight experimental rations:

	Silage	Supplement
1.	corn	+ soybean meal
2.	corn	+ urea
3.	barley	+ soybean meal
4.	barley	+ urea
5.	Arthur wheat	+ soybean meal
6.	Arthur wheat	+ urea
7.	Blue Boy II wheat	+ soybean meal
8.	Eagle wheat	+ soybean meal

All rations were 86% of the appropriate silage and 14% supplement (Table 13.1) on a dry matter basis; all provided 12.5% crude protein; were mixed twice daily and were fed free-choice. Supplements A and B were fed with corn silage; supplement C with barley and Arthur and Blue Boy II wheat silages; supplement D with barley and Arthur silages and supplement E with Eagle wheat silage. In the three urea-containing rations, urea provided 9.9% of the total ration crude protein equivalent. Weights were taken at the beginning and end of the trial after steers were without feed or water 15 hours; 35-day and 70-day intermediate weights were taken before the a.m. feeding.

Results and Discussion

Dry matter, crude protein and crude fiber analysis of the five silages are shown in Table 13.2. The higher protein content of the barley and Arthur wheat silages meant that 45 percent less supplemental protein was needed in supplements fed with them than in supplements fed with corn silage. That limited the amount of urea used in the urea-containing supplement fed with barley and Arthur silages.

Performances of the steers are shown in Table 13.3. All steers had grazed native bluestem pasture from May 1 to October 4, 1974, and were in thin condition when the trial began. That, plus the relatively high grain content of the silages and mild winter weather, resulted in exceptionally good performance by all steers.

Steers receiving soybean meal or urea performed similarly. Daily gain (lbs.) and feed per lb. of gain (lbs.), respectively, were: 2.43 and 7.16 for steers fed soybean meal, and 2.44 and 7.38 for steers fed urea.

Steers fed corn silage gained faster ($P<.05$) and consumed more feed ($P<.05$) but were no more efficient than steers fed barley silage. Steers fed the four corn and barley silage rations gained faster ($P<.05$) and more efficiently ($P<.05$) than those fed any of the four wheat silage rations. Daily gain and efficiency of gain were lower ($P<.05$) for steers receiving the Blue Boy II ration than for those receiving any other wheat silage ration. Raion consumption for the five silages from highest to lowest was: corn, barley, Eagle wheat, Arthur wheat and Blue Boy II wheat.

In our two previous trials, Parker (an awned, hard red winter) wheat silage had a lower feeding value than Blue Boy or Arthur (awnless, soft red winter) wheat silages. Significantly less Parker silage was consumed than Blue Boy or Arthur. The depressed intake was corrected by mixing equal amounts of Parker and corn silage. However, in this third trial, more Eagle wheat silage (an awned, hard red winter) was consumed than either of the two awnless, soft red winter wheat silages. Also, in two trials as much or more awned barley silage was consumed than any of the wheat silages. These results indicate that relative intake and feeding value of wheat silages are influenced by variety differences, not just the presence or absence of awns and not just characteristics of soft red winter or hard red winter wheats.

Table 13.1 Compositions of Five Supplements Fed with the Silage

Ingredient	Supplement A	B	C	D	E
	lbs./ton				
Milo	644.4	1037.4	1324.5	2799.4	1092.4
Soybean meal	1250	800	532	---	757
Urea	---	56	---	56	---
Dicalcium phosphate	35	44	18	29	22
Limestone	8	---	62	53	66
Aureomycin[1]	5	5	5	5	5
Trace mineral premix	1	1	1	1	1
Salt[2]	38	38	38	38	38
Fat	17	17	17	17	17
Vitamin A[3]	1.6	1.6	1.6	1.6	1.6

[1] Formulated to provide 70 mg per steer per day.

[2] Formulated to be 0.3% of the total ration.

[3] Formulated to provide 30,000 IU per steer per day.

Table 13.2 Compositions of the Five Silages Fed in the Steer Trial

Item	Silage: Corn	Barley	Arthur wheat	Blue Boy II wheat	Eagle wheat
Dry matter, %	34.8	34.8	32.2	36.9	34.3
	%, dry matter basis				
Crude protein	9.12	11.95	11.17	11.18	9.55
Crude fiber	19.9	25.5	27.0	28.1	28.0

Table 13.3 Performance of Steers Full-fed Corn, Barley or Wheat Silages Supplemented with Soybean Meal (SBM) or Urea (Ocotber 11, 1974 to January 9, 1975 -- 90 days).

Item	Silages and supplements							
	Corn		Barley		Arthur wheat		Blue Boy II wheat	Eagle wheat
	SBM	Urea	SBM	Urea	SBM	Urea	SBM	SBM
No. of steers	15	15	15	15	15	15	15	
Initial wt. lbs.	590	591	587	587	590	588	593	588
Final wt., lbs.	844	845	820	815	762	761	733	760
Avg. total gain, lbs.	254	254	233	228	172	173	140	172
Avg. daily gain, lbs.	2.83[a]	2.83[a]	2.60[ab]	2.53[b]	1.91[c]	1.92[c]	1.56[d]	1.91[c]
Avg. daily feed, lbs.								
Silage[1]	16.59	16.93	15.07	15.08	12.92	13.61	12.81	14.15
Silage[2]	41.8	42.3	37.7	37.7	32.3	34.0	32.0	35.4
Supplement[1]	2.70	2.73	2.40	2.43	2.08	2.13	1.98	2.17
Total[1]	19.29[a]	19.66[a]	17.47[b]	17.51[b]	15.00[d]	15.74[cd]	14.79[de]	16.32[c]
Feed/lb. of gain, lbs.[1]	6.83[a]	6.95[a]	6.79[a]	6.92[a]	7.86[b]	8.28[b]	9.52[c]	8.53[b]

[1] 100% dry matter basis

[2] 40% dry matter basis.

abcde Means in the same row with different superscripts differ significantly (P<.05).

Micronized Milo and Urea in High-hay Growing Rations for Beef Heifers[1]

Keith Bolsen and Jack Riley

Summary

Twenty-four individually fed heifers were used to evaluate four combinations of micronized or dry-rolled milo and soybean meal or urea supplements in prairie hay growing rations. Feeding 5 lbs. of micronized milo produced 23% faster and 18% more efficient gains than feeding 5 lbs. of dry-rolled milo. Heifers fed micronized milo + urea tended to gain faster and more efficiently than heifers fed dry-rolled milo + soybean meal.

Introduction

Previous research at Manhattan and other midwest stations has shown properly gelatinized milo to be superior to dry-rolled milo in high-grain, beef finishing rations. No data are available to compare the feeding values of gelatinized milo and dry-rolled milo fed in limited amounts in high roughage, beef cattle growing rations. Soybean meal and urea supplments have generally given similar performance in high-grain rations; in high-roughage or silage rations, soybean meal has supported faster and more efficient gains than urea.

This trial evaluated four combinations of micronized or dry-rolled milo and soybean meal or urea supplements in hay rations for growing beef heifers.

Experimental Procedures and Results

Twenty-four Hereford and Hereford-Simmental heifers were allotted by breed and weight to sheltered, individual feeding pens. Six pens were assigned to each of these treatments:

	Milo		Supplement
1.	dry-rolled	+	soybean meal (SBM)
2.	dry-rolled	+	urea
3.	micronized	+	soybean meal (SBM)
4.	micronized	+	urea

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[1] Grain, supplements and partial financial assistance provided by Way-More Feeds, Inc., St. Joseph, Mo. 64501.

All heifers were fed twice daily and received chopped prairie hay to appetite, 4 lbs. of the appropriate milo and 2 lbs. of the appropriate supplement daily. Both supplements contained 32% crude protein (as-fed basis)[a]. Initial and final weights of the heifers were taken after they had gone 15 hrs. without feed or water.

Results of the 84-day growing trial are shown in Table 14.1(parts a and b).

Heifers fed micronized milo + SBM or micronized milo + urea gained faster than heifers fed dry-rolled milo + urea (part a). Heifers receiving micronized milo + SBM were more efficient than those receiving either dry-rolled milo + SBM or dry-rolled milo + urea.

Heifers receiving micronized milo gained faster ($P<.05$) and more efficiently ($P<.05$) than heifers receiving dry-rolled milo (part b). Heifers fed SBM gained 0.1 lb. per day faster and required 1.04 lbs. less dry matter per lb. of gain than heifers fed urea. Heifers fed the urea-containing liquid supplement consumed more hay than heifers fed the SBM supplement (10.55 vs. 10.15 lbs. daily). However, the higher moisture content of the urea supplement compared with the SBM supplement (45% vs. 13%), resulted in identical total ration dry matter consumptions (15.81 lbs. daily).

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[a] Soybean meal supplement: rolled milo, 688 lbs.; soybean meal, 1186 lbs.; dicalcium phosphate, 54 lbs.; salt, 42 lbs.; trace minerals, 8 lbs.; soybean oil, 21 lbs. and vitamin A, 1 lb. Urea supplement: urea mix (100% CP), 514 lbs.; cane molasses, 390 lbs.; calcium lignin sulfonate, 423 lbs.; trace minerals, 2 lbs.; 10-34-0, 70 lbs.; distillers solubles, 600 lbs. and vitamin A, 1 lb.

Table 14.1 Performance of Yearling Heifers fed Dry-Rolled or Micronized Milo With Soybean Meal (SBM) or Urea.[1]

Part a:	Dry-rolled milo		Micronized milo	
	SBM	Urea	SBM	Urea
No. of heifers	6	6	6	6
Initial wt., lbs.	599.0	604.0	591.0	601.7
Final wt., bs.	708.7	709.0	730.3	727.7
Avg. daily gain, lbs.	1.31[b,c]	1.25[c]	1.66[a]	1.50[a,b]
Avg. daily feed, lbs.[2]				
prairie hay	10.12	10.64	10.18	10.47
milo	3.89	4.10	4.19	4.34
supplement	1.61	1.03	1.64	1.05
Total	15.62	15.77	16.01	15.86
Feed/lb. of gain, lbs.[2]	12.12[b]	12.55[b]	9.69[a]	10.98[a,b]

Part b:	Milo		Supplement	
	Dry-rolled	Micronized	SBM	Urea
No. of heifers	12	12	12	12
Avg. daily gain, lbs.	1.28[b]	1.58[a]	1.48	1.38
Avg. daily feed, lbs.[2]				
prairie hay	10.38	10.33	10.15	10.55
milo	4.00	4.26	4.04	4.22
supplement	1.32	1.34	1.62	1.04
Total	15.70	15.93	15.81	15.81
Feed/lb. of gain, lbs.[2]	12.55[b]	10.33[a]	10.92	11.96

[1] 84 days (May 3 to July 25, 1975).

[2] 100% dry matter basis.

a,b,c Means on the same line with different superscripts differ significantly (P<.05).

Whey-reconstituted Milo for Finishing Beef Heifers

Keith Bolsen, Chuck Grimes, and Ross Mickelson

Summary

Three milo treatments were evaluated in finishing rations for heifers: dry-rolled, reconstituted with water, and reconstituted with whey. Reconstituting milo with water or whey did not increase weight gain or efficiency of heifers over that of heifers fed dry-rolled milo. The slowest and least efficient gains were produced by the water-reconstituted milo. Performances were similar for the dry-rolled and whey-reconstituted milo treatments.

Experimental Procedures and Results

Twenty-four Hereford and Hereford x Simmental heifers were allotted by breed and weight to sheltered, individual feeding pens. Eight heifers were assigned to each of three milo treatments: (1) dry-rolled, (2) reconstituted with water and ensiled (water-reconstituted) and (3) reconstituted with partially dehydrated whey[1] and ensiled (whey-reconstituted).

Milo for all three treatments was from the same elevator (14% moisture). Milo in treatments 2 and 3 was raised to 23% moisture by adding water (147 lbs. of water/1000 lbs. of milo) or whey (253 lbs. of whey/1000 lbs. of milo). The whey contained 36% dry matter and 14% crude protein on a dry matter basis. Approximately 8% of the total ration dry matter was whey solids in the whey-reconstituted milo. Reconstituted milo was rolled and ensiled in 55 gallon, plastic-lined metal drums for at least 21-days before being fed.

All rations contained 80% of the appropriate milo, 15% chopped prairie hay and 5% supplement on a 100% dry matter basis and all were mixed and fed to appetite twice daily.

Individual weights were taken at the beginning and end of the trial after heifers were withheld from feed or water 15 hours. Final live weights were adjusted to a constant dressing percentage (61.2%). Carcass data were obtained at Wilson and Co., Kansas City, Mo.

Performances of the heifers for the 86-day trial are shown in Table Heifers fed dry-rolled milo gained faster ($P < .05$) than heifers fed water-reconstituted milo. Heifers receiving whey-reconstituted milo consumed

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[1] Whey provided by Fairmont Foods, Inc., Council Grove, Kansas.

less feed but were as efficient as heifers receiving dry-rolled milo.

These results show that milo reconstituted with whey had a higher feeding value than milo reconstituted with water. However, this trial and previous trials at this station suggest that reconstituted milo that has been rolled and ensiled is not used more efficiently by finishing cattle than is dry-rolled milo.

Table 15.1 Heifer Performance (July 26 to October 20, 1975)

Item	Milo treatment: Dry-rolled	Water-re-constituted	Whey-re-constituted
No. of heifers	8	8	8
Initial wt., lbs.	715	722	720
Final wt., lbs.	932	918	925
Avg. daily gain, lbs.	2.52^{a}	2.28^{b}	2.38^{ab}
Avg. daily feed, lbs.[1]	21.17^{b}	21.30^{b}	19.79^{a}
Feed/lb. of gain, lbs.[1]	8.41^{a}	9.45^{b}	8.33^{a}
Dressing percent	61.0	60.9	61.9

[1] 100% dry matter basis.

[ab] Means on the same line with different superscripts differ signicantly (P <.05).

Sources of Roughage and Milo for Finishing Steers

Keith Bolsen and Jack Riley

Summary

One hundred five yearling steers were used to evaluate seven milo treatments: (1) dry, (2) micronized, (3) steam flaked +.2% propionic acid (acid-flake), (4) field harvested high moisture (F-HM) ensiled whole in an 0_2 -limiting silo, (5) F-HM rolled and ensiled in a concrete stave silo, (6) reconstituted, high moisture (R-HM) ensiled whole in an 0_2-limiting silo and (7) R-HM rolled and ensiled in a concrete stave silo; and three roughages: (1) corn silage, (2) equal parts sorghum silage and milo stover silage and (3) milo stover pellets. The complete mixed rations fed during the 92-day trial were 80% milo, 15% roughage and 5% supplement.

Steers fed micronized or acid-flake milo gained 16 and 20% more efficiently, respectively, than steers fed dry-rolled milo. Efficiencies of gain were similar for steers fed dry-rolled milo and those fed any one of the four high moisture milo treatments. Rates of gain and carcass characteristics were not significantly affected by milo treatment.

Corn silage supported faster (P<.05) and more efficient (P<.05) gains than sorghum-mile stover silages or milo stover pellets.

Introduction

Previous feedlot research at KSU evaluating milo storing and processing indicated: (1) steam-flake, F-HM ensiled in an 0_2-limiting silo or F-HM treated with commercial grain preservatives is superior in feeding value to dry-rolled milo but (2) comparisons between F-HM or reconstituted milo and dry-rolled milo have been inconclusive.

In one previous trial, milo stover was as effective as prairie hay in providing roughage in feedlot rations.

Our objective in this trial was to continue studying milo treatments and roughage sources for feedlot cattle.

Experimental Procedure

One hundred five yearling Hereford steers averaging 795 lbs. were allotted by weight to 21 pens of five steers each. Three pens were assigned to each of these milo treatments: (1) dry, (2) micronized, (3) steam-flaked treated with 0.2% propionic acid, (acid-flake), (4) field harvested, high moisture ensiled whole in an oxygen-limiting silo, (5) field harvested, high moisture, rolled and ensiled in a concrete stave silo, (6) reconstituted, high moisture ensiled whole in an oxygen-limiting silo and (7) reconstituted, high moisture, rolled and ensiled in a concrete stave silo. Seven pens (one from each milo treatment) were assigned to each of these roughage treatments: (1) corn silage, (2) equal parts forage sorghum silage and milo stover silage and (3) milo stover pellets.

All grain was harvested in the fall of 1974 from as uniform a source as possible. Dry milo for treatments 1, 2, 3, 6, and 7 was field-dried. Micronized milo was processed at Kansas Feed Yard, and Brookover Feed Yard, both at Scott City, Kansas.

The 92-day trial began January 21 and ended April 23, 1975. For 90 days before the trial, the steers had received a full-feed of wheat, barley or corn silages. An adjustment ration containing 60% of the appropriate milo, 35% of the appropriate roughage and 5% supplement[1] on a dry-matter basis was fed the first 8 days of the trial. Final rations were 80% milo, 15% roughage and 5% supplement; formulated to 11.5% crude protein, mixed twice daily and fed free-choice. Milo in treatments 1, 4, and 6 was rolled before being mixed into the ration.

Individual weights were taken at the beginning and end of the, trial after steers were without feed or water 15 hours. Final live weights were adjusted to a constant dressing percentage. Carcass data were obtained at Wilson and Co., Kansas City, Mo.

Results

Effects of milo treatments on feedlot performance are shown in Table part a. Steers fed micronized or acid-flake milo gained more efficiently ($P<.05$) than steers fed dry-rolled milo. Only one of the four high moisture milo treatments (field harvested ensiled whole in an oxygen-limiting silo) produced more efficient gains (8%) than dry-rolled milo. In previous research at KSU, both field harvested and reconstituted high moisture milo rolled and ensiled in a stave silo produced 6% more efficient gains than dry-rolled milo. However, in this trial, those high moisture milos were used 6 to 10% less efficiently than dry-rolled milo. Average daily gain and dressing percentages were not significantly affected by milo treatment.

Effects of roughage treatments on feedlot performance are shown in table 16.1, part b. Steers fed corn silage gained 16 to 24% faster and 17 to 21% more efficiently than steers fed sorghum-milo stover silages or milo stover pellets. Only one-third of the additional gain produced by corn silage could be due to its higher grain content.

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[1] lbs. per ton, air-dry basis; rolled milo, 988; soybean meal, 340; limestone, 210; dicalcium phosphate, 56; potassium chloride, 36; urea, 234; salt, 92; trace minerals, 9; aureomycin, 13; vitamin A, 4 and soybean oil, 18.

Table 16.1 Performances of Steers Fed Indicated Rations.[1]

Part a: Milo treatments

Item	Dry	Micron-ized	Acid flakes	Field high moisture: O_2-limiting	Field high moisture: stave	Reconstituted high moisture: O_2-limiting	Reconstituted high moisture: stave
No. of steers	15	15	15	15	15	15	14
Initial wt., lbs.	796	794	791	793	794	797	799
Final wt., lbs.[3]	1021	1036	1019	1039	1007	1022	1027
Avg.,daily gain, lbs.	2.45	2.63	2.48	2.68	2.32	2.45	2.48
Avg. daily feed lbs.[2]	21.86 ^{a}	19.71^{a,b}	17.37 ^{a}	22.17^{a}	22.37^{a}	22.68^{a}	23.42^{a}
Feed/lb. of gain lbs.[2]	9.02^{b}	7.58^{a}	7.23^{a}	8.35^{a,b}	9.88^{b}	9.41^{b}	9.51 ^{b}
Dressing %	58.1	57.4	57.8	58.0	57.9	57.6	57.3
Grain moisture, %	14.1	16.1	9.0	24.2	25.7	21.8	22.7

Part b: Roughage treatments

	Corn silage	Milo stover/sorghum silage	Milo stover pellets
No. of steers	34	35	35
Initial wt., lbs.	796	794	795
Final wt., lbs.[3]	1061	1017	996
Avg. daily gain, lbs.	2.88^{a}	2.43^{b}	2.19^{b}
Avg. daily feed lbs.	21.52	21.88	20.71
Feed/l+ of gain lb.	7.50^{a}	9.11^{b}	9.54^{b}
Dressing %	58.5	57.5	57.3
Roughage dry matter, %	33.6	33.2	91.5

[1] 92 days (January 21 to April 23, 1975).

[2] 100% dry matter basis.

[3] Adjusted to a 57.5% dress.

[a,b] Means on the same row with different superscripts differ significantly (P<.05)

Harvesting Sorghum Stover

G. E. Fairbanks[1] and J. D. Hoover[2]

Two types of big round balers and a small stackmaker were used to harvest grain sorghum stubble after the grain was harvested during the fall and winter months of 1975. The stubble was about 21 inches high and about 4 inches of stubble was left after windrowing.

Tests for each machine were replicated four times for each set of conditions. Averages of results for each set of conditions are shown in Table 17.1.

Accurate comparisons among different forage-gathering machines in regard to package weight and density and yield are difficult because field conditions vary, machines malfunction and operating procedures are seldom standard.

Our limited tests showed that with windrowed sorghum stover the Model 5600 baler makes a denser bale than the Model 5400 but yield per acre was higher with the Model 5400. The Model 5400 baler did an excellent job of picking up windrowed material and also combine leavings which remained after a field forage harvester had been used to remove sorghum stubble. Ash content of the combine leavings harvested by the Model 5400 baler was 47% or more than twice as much as that for any other harvesting method. The ash came on soil picked up with the combine leavings that had lain on the ground and been rained on.

The low yield of windrowed material gathered by the StakHand 10 as compared to that of the two balers for the October 16 tests is not significant because the bearings on the pickup height gauging roller failed and the roller was removed. Then it was not possible to pick up the material cleanly.

In three tests of windrowed stover on October 21, that seemed even drier than the moisture percentages indicate, nearly all of the moisture was in the stems. Density of the bales for both balers was nearly the same but the yield from the Model 5400 was significantly higher than that for the Model 5600 baler. Some dry leaf material was lost from the rear of the Model 5600 baler. The Model 5400 also seemed to do a better job of picking up the dry stover.

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[1]Professor, Department of Agricultural Engineering.

[2]Assistant Professor, Department of Animal Science and Industry.

The height gauging roller for the Model 10 StakHand had been replaced before the October 21 tests. Yield with it compared favorably with yields from the two balers used that day. However, package density for the Model 10 StakHand was only 5.00 lb/ft^3, less than half that for either of the two big balers.

Five-inch wide sorghum paddles were used December 16 and 18 on the flail type pickup of the StakHand 10 to harvest standing sorghum stubble directly without windrowing. The stems were frozen. Air temperature was 34°F and 22°F on the two dates and two stacks were made each day. Ground surface was slightly thawed December 16 so the paddles probably picked up some soil. Weight of the two stacks made December 16 was higher than normal. Row spacing was 30 inches. The width of the pickup on the StakHand 10 is 5 feet, so that only two rows of standing stubble could be harvested each trip through the field. The height of the stubble left after being beaten off by the StakHand 10 pickup device varied from 6 to 10 inches. Laboratory analysis of samples from the stacks made on December 16 and 18 were not available at the time of preparation of this report.

Thermocouples were placed in the center of each of the bales and stacks at time of harvest to monitor temperature. By mid-December temperatures had not completely stabilized. The maximum temperature measured in both bales and stacks was slightly over 150°F.

All of the methods of harvesting grain sorghum stubble stover tried in this series of tests seem to be successful. A field Queen forage harvester was also successfully used to remove and chop the sorghum stubble for storage as silage but is not covered in this report. Feeding trials are currently underway by the Animal Science and Industry Department at Kansas State University.

Table 17.1 1975 Sorghum stover harvesting data.

Harvest Date 1975	Sorghum Stubble Condition	Machine[2]	Moisture W. B. %	Dry Matter Yield Tons/A	Bale or Stack		Results of laboratory analysis				
					Weight lb.	Density lb/ft	% Ether Extract	% Crude Fiber	Mg N per gm	% Prot. N x 6.25	% Ash
Oct. 16	Windrowed	HB-5600	47.93	1.63	1558	12.75	1.65	25.20	7.06	4.41	21.87
16	Combine Leavings[1]	HG-5400	25.82	2.61	820	9.87	1.23	16.47	5.91	3.69	47.04
16	Windrowed	HG-5400	46.90	2.06	878	8.71	1.61	29.86	6.41	4.01	10.96
16	Windrowed	HS-10	52.42	1.04	3508	9.97	1.34	27.78	8.22	5.14	11.69
21	Windrowed	HB-5600	33.19	0.96	1293	10.76	2.04	27.87	6.01	3.76	12.45
21	Windrowed	HG-5400	34.73	1.79	1098	10.79	1.89	22.88	8.36	5.23	22.15
21	Windrowed	HS-10	31.86	1.75	1840	5.00	1.89	31.51	7.85	4.91	10.38
Dec. 16 and 18	Standing Stubble	HS-10	-----	----	4160	10.04	----	-----	----	----	-----

[1]Material left after field forage harvester had removed sorghum stubble.

[2]HB-5600, Hesston Rounder Model 5600 Giant Round Baler.
HG-5400, Hesston Rounder Model 5400 Giant Round Baler.
HS-10, Hesston Model 10 StakHand.

Milo Stover and Forage Sorghum Silages for Growing Heifers

Keith Bolsen, Jack Riley, Larry Corah,
and Chuck Grimes

Summary

Ninety-six heifer calves were used to compare four silage combinations: (1) 100% milo stover, (2) 67% milo stover and 33% forage sorghum, (3) 33% milo stover and 67% forage sorghum and (4) 100% forage sorghum. Each ration was fed to four pens of six heifers each during the 88-day trial. Heifers fed 100% forage sorghum made the fastest and most efficient gains($P<.05$); those fed 100% milo stover, the slowest and least efficient gains ($P<.05$). Based on gains obtained from these two rations, the 67% milo stover silage ration produced 16% faster gain than predicted; the 33% milo stover ration, a 5% faster gain than predicted.

Introduction

Milo stover silage and dehydrated milo stover pellets were compared with forage sorghum silage in two previous heifer growing trials at this station (Prog. Rept. 210, Kan. Agr. Expt. Sta., 1974 and Prog. Rept. 230, Kan. Aqr. Expt. Sta., 1975). Results showed: (1) milo stover had a feeding value of 63 to 67% that of forage sorghum, (2) cattle consumed 12 to 14% less milo stover silage than forage sorghum silage, and (3) growing calves fed milo stover silage as the major energy source should gain about 1.0 lb. per day and require about 10 to 14 lb. of dry matter per lb. of gain, less than acceptable performance for most cattle feeders.

Could milo stover provide only a part of the energy in growing rations? Our objective in this trial was to measure performances obtained with various percentages of milo stover and forage sorghum silages.

Experimental Procedure

Milo stover and forage sorghum (high-grain variety) each was obtained from a single source in October, 1974. The forage harvester was equipped with a two-inch recutter screen and both forages were ensiled in upright concrete stave silos (10 ft. x 50 ft.). Moisture content of the milo stover was about 65%; that of the forage sorghum, about 30%.

Ninety-six heifer calves of Angus, Hereford, Angus x Hereford and Simental x Hereford breeding were used in the 88-day trial (December 10, 1974 to March 10, 1975). They were allotted by breed and weight into 16 pens of six heifers each. Four pens (two light-weight, averaging 430 lbs. and two heavy-weight, averaging 577 lbs.) were assigned to each silage combination: (1) 100% milo stover, (2) 67% milo stover and 33% forage sorghum, (3) 33% milo stover and 67% forage sorghum and (4) 100% forage sorghum.

Compositions of the four experimental rations and their supplements are shown in table 18.1. All rations were formulated to be equal in crude protein (12.5%), minerals, vitamins and additives. Rations were mixed twice daily and fed free-choice, Initial and final weights of the heifers were taken after they went 15 hours without feed or water.

Results

Dry matter (%) and crude protein (% on a dry matter basis) for the milo stover were 33.6 and 4.25; for the forage sorghum silage, 29.8 and 7.1.

Heifer performances are shown in table 18.2. Heifers fed the 100% forage sorghum silage ration gained faster ($P<.05$) and more efficiently ($P<.05$) than heifers fed any of the other three rations. Heifers receiving 100% milo stover silage had the slowest ($P<.05$) and least efficient ($P<.05$) gain. As forage sorghum increased and milo stover decreased in the ration, rate of gain increased and feed required per lb. of gain decreased. Dry matter consumption tended to increase as forage sorghum replaced milo stover.

Light-weight and heavy-weight calves had similar gains, but light-weight calves gained more efficiently (7.98 lbs. vs. 9.60 lbs. of feed per lb. of gain).

Estimated net energies for the two silages were calculated from gains and feed intakes obtained from the 100% milo stover and 100% forage sorghum silage rations. The estimates gave predicted daily gains for heifers fed the 67% and 33% milo stover rations to be 1.29 and 1.58 lbs., respectively, but actual daily gains were 1.50 and 1.66 lbs., respectively. These results suggest that milo stover silage may have greater value than expected when it is fed in combination with a higher-energy forage.

Table 18.1 Compositions of the Rations and Supplements used to compare Milo Stover and Forage Sorghum Silages.

	Rations[1]			
Ingredient	100% MSS	61% MSS 33% FSS	33% MSS 67% FSS	100% FSS
Milo stover silage	73.0	48.9	24.1	--
Forage sorghum silage	--	24.1	48.9	73.0
Milo	7.0	7.0	7.0	12.0
Soybean meal	5.0	5.0	5.0	--
Supplement A	15.0	--	--	--
Supplement B	--	15.0	--	--
Supplement C	--	--	15.0	--
Supplement D	--	--	--	15.0

	Supplements[2]			
	A	B	C	D
Soybean meal	1793	1524	1264	1688
Milo	87	361	640	208
Dicalcium phosphate	36	45	13	30
Limestone	28	13	27	10
Salt	30	30	30	30
Fat	18	18	18	18
Aureomycin[3]	6	6	6	6
Trace mineral premix	1	1	1	1
Vitamin A premix[4]	+	+	+	+

[1] % on a dry matter basis.
[2] lbs./ton on an as-mixed basis.
[3] added to supply 70 mg per heifer per day.
[4] added to supply 30,000 IU per heifer per day.

Table 18.2 Performances of Heifers fed Indicated Rations.

	Ration			
	100% MSS	67% MSS 33% FSS	33% MSS 67% FSS	100% FSS
No. of heifers	24	24	24	24
Initial wt., lbs.	502	503	505	502
Final wt., lbs.	591	635	651	667
Avg. 88-day gain, lbs.	89	132	146	165
Avg. daily gain, lbs.	1.01[d]	1.50[c]	1.66[b]	1.88[a]
Avg. daily feed, lbs.	12.12[b]	12.38[a,b]	12.94[a]	12.92[a]
Feed/lb. of gain, lbs.	12.08[c]	8.35[b]	7.85[a,b]	6.88[a]

[a,b,c,d]Means on the same row with different superscripts differ significantly (P<05).

[1]100% dry matter basis.

Excreta Silage for Maintaining Pregnant Cows and Heifers

Miles McKee, K. L. Conway, G. Fink, J. G. Riley,
K. Kimple, and J. D. Hoover

Summary

Preliminary trials the summer of 1975 tested the value of excreta silage for maintaining pregnant cows and heifers. Ingredients in the excreta silage were wheat straw, cattle excreta, corn, and molasses.

Eighty mature cows were divided into three lots and received either excreta silage, alfalfa haylage, or ½ excreta silage and ½ alfalfa haylage as sources of roughage for 59 days (July 25 to September 22). Cows receiving excreta silage tended to gain more than cows on haylage or ½ haylage and ½ excreta silage.

Twenty-nine, sixteen-month old, pregnant, part Simmental heifers were divided into two lots. One group received excreta silage the other, haylage, as roughage for 52 days (July 25 to September 15). Their gains did not differ significantly.

Introduction

Alternative sources of feed for cows include waste products. R. L. Vetter et. al. at Iowa State University successfully ensiled dry corn stalks and cattle excreta. Others have demonstrated the nutritive value of cattle excreta, so we tested silage made from wheat straw and cattle excreta to obtain information on methods of preparing the silage, costs, storage, palatability, and animal response.

Experimental Procedure

Fresh excreta for the silage was collected by twice a week scraping the concrete floor where steers were fed for slaughter. Dry excreta came from the same concrete floors but had been stockpiled for as long as three months. Baled wheat straw was chopped to two- to four-inch lengths. Composition of the excreta silage is given in table 19.1. The ingredients were mixed in a Harsh Mobile Mix and blown into a 10-foot-diameter, upright, concrete stave silo.

Eighty mature, lactating, pregnant cows (48 part Simmental and 32 Hereford) were randomly divided by age and breed into three lots July 25, 1975. All calves were weaned early (August 6). Cows continued on test until

September 22. Rations for the cows and their responses are given in table 19.2.

Twenty-nine pregnant, sixteen-month-old, part Simmental heifers were divided into two lots July 25, 1975. Rations fed the heifers and their responses are listed in table 19.2. The trial ended September 15, 1975.

Results and Discussion

The excreta silage had a pungent, acid odor with little excreta odor. Cows and heifers readily ate the silage.

Mature cows on excreta silage gained 78.3 lbs; on haylage, 30.9 lbs.; and on ½ haylage and ½ excreta, 16.4 lbs. during the 59-day trial (table 19.2). Rations were not equal in dry matter, nitrogen, or calories.

Heifers on excreta silage gained 58.9 lbs. compared with 47.1 lbs. by those on haylage during the 52-day trial (table 19.2).

Results of the two trials indicate that costs if excreta silage are similar to costs of ensiling forage sorghum, corn, or alfalfa. No problesm were encountered with storage or palatibility. More such studies are planned.

Table 19.1 Composition of excreta silage

Ingredient	% as mixed: Fresh excreta	% as mixed: Dry excreta	lbs./ton: Fresh excreta	lbs./ton: Dry excreta
Excreta	55.0	28.0	1100	560
Wheat straw	18.4	18.8	368	376
Cracked corn	3.3	3.2	66	64
Wet molasses	6.6	7.0	132	140
Water	16.7	43.0	334	860

Table 19.2 Daily intake and response of cows and heifers

	Daily intake (lbs): Excreta silage	Haylage	Corn	Supplement[a]	Dry matter[b]	Gain (lbs): Total	A.D.G.
Cows							
Lot 1 (27 head)	60	--	3.4	1	22.5	78.3	1.33
Lot 2 (27 head)	34.8	15.5	3.4	1	23.0	16.4	.28
Lot 3 (26 head)	--	30.8	3.4	1	20.4	30.9	.52
Heifers							
Lot 1 (15 head)	45	--	2	1	16.7	58.9	1.13
Lot 2 (14 head)	--	34.3	2	1	17.1	47.1	.91

[a] Supplement formulation lbs/ton: SOM, 1070; rolled milo, 491; salt, 200; bone meal, 134; urea, 64; Z-10 trace mineral, 20; aurofac 10, 15; vitamin A, 30,000, 6; wet molasses, 40.

[b] Percentages of dry matter: excreta silage, 31; haylage, 50; corn, 88; supplement, 90.

Energy Levels and Roughage Sources for Bulls on 140-day Test

Miles McKee, K. L. Conway, G. Fink
R. R. Schalles, K. K. bolsen,
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Summary

Eight Hereford, 16 Angus, and 36 part Simmental bulls were tested for 140 days (October 15, 1974 to March 4, 1975) for weight gained. Bulls were divided into four groups and fed four rations that had been formulated for two energy levels (high or medium) and two sources of roughage (corn silage or oats and prairie hay).

Average daily gains (lbs.) on the four rations were: high energy silage, 3.36; high energy oats and prairie hay, 3.31; low energy silage, 2.77; and low energy oats and prairie hay, 3.25.

Introduction

This continued a similar test reported in the 1975 Cattlemen's Day report.

Experimental Procedure

Sixty bulls (8 Hereford, 16 Angus, and 36 part Simmental) produced in the Kansas State University herds were randomly allotted by breed to four rations (table 20.1). Two bulls on the low energy oats and prairie hay ration were removed during the test. Neither was attributed to ration.

Prairie hay was chopped to two-inch lengths so that all rations were completely mixed. Bulls were fed all they would eat twice daily.

Results

Bull performances are reported in table 20.3. Bulls on low energy silage gained significantly less than those on other rations. Similar results were reported from the 1973-1974 test.

Table 20.1 Rations for 140-day weight-gaining test by beef bulls.

Ingredient	Ration*** A Silage	B Oats and prairie hay	C Silage	D Oats and prairie hay
	Percentage of feedstuffs on dry matter basis			
Rolled milo	68.3	68.3	6.7	16.7
Supplement*	16.7	16.7	16.7	16.7
Corn Silage	15.0	---	76.6	---
Chopped prairie hay	---	7.5	---	33.3
Rolled oats	---	7.5	---	33.3
NE_m**	90.6	89.9	75.8	74.9
NE_p**	58.4	58.0	45.5	45.3

*Formulation given in table 20.2.

**Calculated.

***A&B = high energy.

C&D = low energy.

Table 20.2 Composition of supplement used with all rations in weight-gaining test.

Ingredient (lbs./ton)	Rations A&B	C	D
Soybean oil meal	1330.0	1686.0	1176.0
Milo	511.3	189.3	694.3
Dicalcium phosphate	16.0	54.0	10.0
Calcium carbonate	80.0	8.0	57.0
Salt	30.0	30.0	30.0
Fat	20.0	20.0	20.0
Trace minerals	5.0	5.0	5.0
Vitamin A	3.0	3.0	3.0
Aurofac-10	4.7	4.7	4.7

A&B = High energy

C&D = Low energy

Table 20.3 Performances of bulls on indicated rations during 140-day test.

	Ration[1] A	B	C	D
No. of bulls	15	15	15	13
Avg. wt. 10-15-74, lbs.	626.5	631.9	623.0	625.5
Avg. age 10-15-74, days	223	227	221	222
Avg. wt. 3-4-75, lbs.	1097.3	1095.3	1011.3	1073.8
Avg. daily D.M. intake, lbs.	19.77	19.53	15.69	20.37
A.D.G., lbs.	3.36	3.31	2.77	3.25

[1] Rations listed in table

Effect of Rumensin on Performance of Growing Heifers

Jack Riley, Keith Bolsen, Larry Corah,
and Galen Fink

Summary

We used 136 Hereford heifer calves in two studies to determine the effect on performance of 200 mg monensin (trade name Rumensin[1]) per head daily. It significantly improved gain by 7.5% and 4.6% in trials 1 and 2 respectively, and significantly improved efficiency 11.6% and 12.2%, respectively.

Introduction

Rumensin was cleared for use in feedlot rations by the FDA in late December, 1975. It has consistently improved efficiency of gain in feedlot cattle with limited influence on daily gain. The mode of action appears to be to increase the molar proportion of propionic acid in the rumen. Ruminants use the energy from propionic acid much more efficiently than that from acetic or butyric acids, the other two in abundant supply. We wanted to determine the effect of 200 mg Rumensin per head per day on performance of beef heifer calves fed high-silage rations instead of typical high-concentrate rations.

Procedure

Trial 1. Ninety-six Hereford heifers were allotted at random, 6 each to 16 pens. Eight pens were fed control rations; and 8 the same rations plus a premix that provided 200 mg Rumensin daily per heifer. Composition of the complete rations is shown on page 46.

Trial 2. Forty Hereford heifer calves were allotted at random to 10 pens of 4 heifers each. Five pens were controls, five were fed the same rations plus 200 mg Rumensin daily per heifer. Supplement composition is shown in Table 21.1.

Fecal samples, obtained early in both studies, were negative for coccidia oocysts. Rumen samples for volatile fatty acids were taken on day 56 of each trial. Heifers were fed twice daily all they would eat. Individual weights were taken initially, at 28-day intervals, and at the end of each trial. Initial and final weights were taken after a 15-hour shrink.

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1 Rumensin and partial financial assistance provided by Eli Lilly Co.
Rumensin is a trade name of Elanco Products Co.

Results

Heifer performance data for the two trials are summarized in Table 21.3 Feeding 200 mg Rumensin improved daily gain 7.5 and 4.6%, reduced daily feed intake 5 and 8.2% and improved efficiency 11.6 and 12.2% in trials 1 and 2, respectively. Results of the rumen-volatile fatty-acid samples are shown in Table 21.4 . Propionic acid had increased 19 and 49% in Rumensin-treated heifers in studies 1 and 2, respectively.

Table 21.1 Composition of Supplement -- Trial 2

Supplement Ingredient	Percent
Soybean Oil Meal	63.20
Milo, Ground	32.30
Dicalcium Phosphate	0.67
Limestone	1.33
Salt	1.51
Fat	0.89
Trace mineral	0.04
Vitamin A	0.06

Table 21.2 Composition of Rations -- Trial 2

	0 - 56 days		57 - 112 days	
Ingredient	% (D.M. basis)	% C.P	% D.M. basis)	% C.P
Corn silage	79.5	8.6	--	--
Supplement (see table 1)	9.6	36.8	10.3	36.8
Premix[1]	10.9	19.7	--	--
Sorghum silage	--	--	78.1	6.7
Premix[2]	--	--	11.6	28.4
Complete ration	100.0	12.5	100.0	12.3

[1] Premix was 1 part soybean oilmeal and 3 parts milo[3].

[2] Premix was 2 parts soybean oilmeal and 2 parts milo[3].

[3] Rumensin was added in the milo portion to provide 200 mg per heifer per day.

Table 21.3 Effect of Rumensin on Performance of Growing Heifers

Item	Trial 1[1]		Trial 2[2]	
Dosage	0	200 mg	0	200 mg
No. heifers	48	48	20	20
Initial wt, lbs.	501.9	503.8	452	452
Final wt, lbs.	665.4	679.6	671	680
ADG	1.46	1.57	1.95	2.04
ADF (D.M. basis)	12.92	12.27	15.7	14.4
Eff.	8.85	7.82	8.05	7.06

[1] Trial 1 was conducted Dec. 12, 1974 - March 10, 1975

[2] Trial 2 was conducted May 1, 1975 - August 10, 1975

Table 21.4 Effect of Rumensin on Ruminal Volatile Fatty Acids

treatment:	Control		200 mg/day	
trial:	1	2	1	2
No. heifers	10	10	10	10
Molar % VFA conc.				
Acetic	66.0	66.8	60.7	59.3
Propionic	23.0	22.1	27.4	33.0
Butyric	10.9	11.1	11.8	7.7

Effect of Rumensin on Performance of Finishing Steers

Jack Riley and Galen Fink

Summary

Two hundred ten Hereford x Angus crossbred yearling steers were used in two trials to determine effects of Monensin (trade name Rumensin)[1] on performance and carcass characteristics. Top dressing a protein supplement (crumbles or pellets) containing Rumensin was an acceptable way to feed the compound in trial 1. Rumensin increased gain 2.0%, reduced feed intake 4.3%, and improved feed efficiency 6.1%.

Trial 2 was conducted to determine if Rumensin could be fed to steers after they had been on a high concentrate ration at least 56 days. Four levels (0, 10, 20, and 30 grams per ton) were compared. Ten or 20 grams per ton was most beneficial the final 63 days in the feedlot after a preliminary feeding period of 56 days without Rumensin.

Introduction

Previous studies with Rumensin (including two with growing heifers at Kansas State) showed that it improved efficiency when fed in a complete mixed ration the duration of the experiment. This time we wanted to determine (1) if Rumensin could be fed in a top dress protein supplement as either crumbles or pellets, (2) if daily Rumensin could be provided in ½, 1, or 2 pounds of top dressed supplement, and (3) if less Rumensin (100 or 200 mg) was beneficial during the first 28 days instead of the recommended 300 mg. daily.

In trial 2 we wanted to determine (1) if Rumensin could be added to the ration of steers that had been on a high concentrate ration at least 56 days and (2) if 10, 20, or 30 grams per ton was the most beneficial level of Rumensin to feed under these conditions.

Procedure

Two Hundred ten Hereford x Angus crossbred yearling steers were purchased from one rancher in southwestern Kansas. They were in excellent

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1 Rumensin is a trade name of Elanco Products Co. Rumensin and partial financial assistance provided by Eli Lilly Co., Greenfield, Ind. Dr. Herman Grueter of Eli Lilly Co. deserves special recognition for his assistance.

health and already adapted to a medium-concentrate ration when purchased. The heaviest 150 were allotted at random to 30 pens of 5 steers each for trial 1. The remaining 60 were divided into 12 pens of 5 each for trial 2. All steers in both studies were fed a 90% concentrate (corn plus appropriate supplement) and 10% corn silage on a dry matter basis. Composition of the supplement is shown in table 22.1.

Steers were fed twice daily ad libitum. Individual weights were taken after approximately 15 hours without access to feed or water at the beginning and end of each study. Weights at 28-day intervals were taken before the morning feed. Slaughter and carcass data were collected at Wilson and Co., Kansas City, Mo.

Rumen samples were taken to determine if Rumensin altered the ratio between acetic and propionic acids.

Results

Performance data for trial 1 are given in table 22.2. Rumensin increased gain 2%, reduced feed intake 4.2% and improved feed efficiency 6.1% (averages from the 3 Rumensin levels fed). There was no apparent advantage to feeding 100 or 200 mg the first 28 days. The supplement containing Rumensin was fed satisfactorily as a top dressing at ½, 1, or 2 pounds daily in either crumble or pellet form. Some sorting, especially by certain steers suggest, that the Rumensin and supplement should be thoroughly mixed into the ration.

Performance data for trial 2 are shown in table 22.3. All steers were fed the same for 56 days and then 3 pens were fed Rumensin at 0, 10, 20, or 30 grams per ton of complete ration during the final 63 days. Daily gain daily feed, and efficiency are shown for the entire 119 days on feed, the first 56 days, and the final 63 days. The most improvement in gain and efficiency was at the 10 grams per ton of complete ration. Rumensin at 20 grams per ton reduced feed intake and improved efficiency compared to the 0 level while 30 grams per ton appeared to depress gain and efficiency when fed at this level the final 63 days before slaughter.

Results of this study suggest that Rumensin can be fed to steers already on a high concentrate ration, however, less than 30 grams (10 or 20) per ton may be necessary during a short feeding period (63 days in this trial).

No apparent differences were observed in carcass characteristics as indicated in Tables 22.2 and 22.3 .

The effect of Rumensin on rumen volatile fatty acid concentrations is shown in Table 22.4. The same 6 steers in each treatment group were sampled on July 21, 1975 before Rumensin feeding began and again on Sept. 11, 1975, after Rumensin had been fed for 51 days. Acetic acid was reduced by 9.3% and propionic acid was increased by 8.3% in steers fed Rumensin.

Table 22.1 Composition of Protein Supplements - Trials 1 & 2

Ingredient	% (Dry matter basis)
Soybean oilmeal	60.0
Corn	8.8
Fat	1.0
Urea	5.0
Limestone	15.6
Salt	5.0
Potassium Chloride	2.6
Premix[1]	2.0

[1]Premix was 7.5% Vitamin A (10,000 I.U./gm), 25% trace minerals and 67.5% ground corn.
Rumensin replaced ground corn to provide the necessary level of additive in the complete supplement

Table 22.2 Effect of Rumensin on Performance and Carcass Characteristics Of Finishing Steers Trial 1 - May 27, 1975 - Sept. 16, 1975

			Daily Rumensin Intake (mg.)		
	0-28 days:	0	100	200	300
Item	29-112 days:	0	300	300	300
No. steers		40	20	20	68
Initial wt., lbs.		721.95	721.25	720.5	720.49
Final wt., lbs.		1106.8	1121.3	1103.5	1116.97
A.D.G., lbs.		3.44	3.57	3.42	3.54
A.D.F., lbs.		24.70	23.95	23.56	23.4
Eff., lbs.		7.18	6.71	6.89	6.62
Dressing %		62.8	62.5	62.4	62.8
Fat, in.		0.69	0.63	0.7	0.67
USDA grade[1]		6.7	6.3	6.6	6.70
Cutability %		48.6	48.8	48.5	48.80

[1] 6=Good +, 7=Choice -

Table 22.3 Effect of Rumensin on Performance and Carcass Characteristics of Finishing Steers Trial 2 - May 27, 1975 - Sept. 23, 1975

	Rumensin Level in Ration (gm/ton)			
0-56 days:	0	0	0	0
Item 57-119 days:	0	10	20	30
No. steers	15	15	15	15
Initial wt., lbs.	633.1	640.4	639.5	627.6
Final wt., lbs.	1040.7	1046.0	1047.2	1009.9
A.D.G., lbs.				
(0-119 days)	3.43	3.41	3.43	3.21
(0-56 days)	3.92	3.75	3.89	3.96
(57-119 days)	2.98	3.11	3.02	2.55
A.D.F., lbs.				
(0-119 days)	22.89	22.09	22.73	22.08
(0-56 days)	22.01	21.85	22.97	22.96
(57-119 days)	23.77	22.32	22.49	21.19
Eff., lbs.				
(0-119 days)	6.67	6.48	6.63	6.88
(0-56 days)	5.63	5.85	5.91	5.82
(57-119 days)	7.98	7.18	7.45	8.31
Dressing %	61.5	61.6	61.7	62.0
Fat, in.	0.64	0.64	0.60	0.65
USDA grade[1]	6.90	6.10	6.50	6.10
Cutability, %	49.7	49.3	49.8	49.4

[1] 6=Good +, 7=Choice -

Table 22.4. Effect of Rumensin on Volatile Fatty Acid Concentration in Rumen - Trial 2

	Rumensin, grams/ton of Complete Feed							
	0-56 days				57-119 days			
Item:	0	0	0	0	0	10	20	30
No. samples[1]	6	6	6	6	6	6	6	6
Acetic, molar %	50.1	50.7	46.4	46.1	46.8	44.2	42.1	43.4
Propionic, molar %	40.0	40.9	45.8	47.1	44.6	46.3	50.5	48.2
Butyric, molar %	9.9	8.4	7.9	6.8	8.8	9.5	7.4	8.3

[1] The same 6 steers in each treatment group were sampled on July 21, 1975 prior to feeding Rumensin and on September 11, 1975, after Rumensin had been fed for 51 days.

Efficacy of TROLENE 40 Insecticidal Premix[1] to Control Grubs in Feedlot Cattle

Jack G. Riley and Galen Fink

Summary

Ninety Angus crossbred steers originating from northwestern Nebraska and averaging 440 lb. were used to evaluate the efficacy of TROLENE 40 insecticidal premix to control cattle grubs in feedlot cattle. Thirty steers were randomly assigned to each of these three treatments: (1) control; (2) .0018 lb. ronnel/100 lb. body weight per day for 7 days; (3) .0009 lb. ronnel/100 lb. body weight for 14 days. The active ingredient was incorporated into a ground-sorghum-grain premix and fed in the complete ration. The trial started November 21; the 14-day feeding ended December 2, 1974. Grub counts were made February 27, 1975. The control steers had 188 grubs for an average of 6.3 grubs per steer. The 7-day treatment group had 10 grubs; the 14 day group, 3 grubs, so control was 95 and 98%, respectively, for the two treatments.

Introduction

Most conscientious cattle feeders control grubs with dips, sprays, mineral mixes, or pour-on insecticides. A convenient method of incorporating a control into feedlot rations for a few days should be more acceptable.

Experimental Procedure

Ninety Angus crossbred steer calves were purchased from one ranch in northwestern Nebraska for this project. They were weighed individually and assigned at random to three treatment groups of 30 each. Treatment 1 steers (control) received no insecticidal premix.

Treatment 2 steers were fed .0018 lb. of ronnel/100 lb. body weight per day 7 days and treatment 3 steers, .0009 gm ronnel/100 lb. body weight per day 14 days. The active ingredient was incorporated into a ground-sorghum-grain premix and fed once a day in the complete ration.

The trial started November 21, the 14-day feeding ended December 2, 1974. Grubs in each steer were counted February 27, 1975.

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[1] TROLENE 40 and partial financial assistance were provided by Dow Chemical Company, Midland, Mich.

Results and Discussion

Results are shown in table 23.1. Twenty-four of the control steers had 1 or more grubs with an average of 6.3 per steer and a range of 0-24. Four steers in the 7-day treatment had a total of 10 grubs and a range of 0-6. Only two steers in the 14-day group had grubs with a total of 3. The treatments gave 94.8% and 98.4% grub control for the 7- and 14-day treatments, respectively. No palatability or excessive salivation problems were observed. Health of the steers was excellent before and during the trial.

Our data indicate that TROLENE 40 insecticidal premix may be incorporated into daily rations for 7 to 14 days to effectively control grubs in feedlot cattle.

Table 23.1 Results from feeding TROLENE 40 insecticidal premix to control grubs in feedlot cattle.

	Treatment		
Item	Control	7-Day	14-Day
No. of steers	30	30	30
Health	good	good	good
Palatability problems	0	0	0
Daily ronnel intake	0	.0018 lb/100 lb.	.009 lb/100 lb.
No. grubs	188	10	3
Range per steer	0-24	0-6	0-2
% control	---	94.8	98.4

Feeding Propionic Acid-treated, Flaked Sorghum to Finishing Steers

Jack G. Riley, Terry Gugle, and Galen Fink

Summary

Fifty-four yearling Hereford steers averaging 805 pounds were used in an 86-day finishing trial to determine the effect of adding low levels of propionic acid to steam flaked sorghum grain. Three treatments were examined. Treatment one consisted of sorghum grain steam flaked twice weekly for a maximum of 4 days between flaking. Treatment two was the same as treatment 1 except that propionic acid was added into the discharge auger at 0.15% of the weight of the flakes. Treatment three was flaking once a week with propionic acid added at 0.25% of the weight of the flakes. Both acid levels significantly ($P<.05$) improved gain and efficiency.

Introduction

We, and commercial operators have observed that steam flaked grain appeared to lose quality and palatability when not fed the day it was processed. Even though flaked grain was dried to approximately 84% dry matter, it deteriorated noticably when stored more than three days in warm humid weather. That prompted us to try propionic acid (less than 0.3% of flake weight) to maintain quality and to extend storage life of flaked grain.

Procedure

Fifty-four yearling Hereford steers averaging 805 lbs. were divided into 3 treatment groups for an 86-day trial. The three treatments were: (1) sorghum grain flaked twice per week for a maximum of 4 days storage between flaking; (2) sorghum grain flaked at the same intervals as treatment 1 with propionic acid added into the discharge auger at 0.15% of the weight of the flakes; (3) sorghum grain flaked once a week with propionic acid added at 0.25%. Composition of the rations on a dry matter basis was 80% steam flaked milo, 5% protein supplement, and 15% corn silage. The trial began November 12, 1974, and ended February 6, 1975. Individual weights were taken initially, at 28-day intervals, and at completion. Carcass data for each steer were collected at Wilson and Company, Kansas City, Mo.

Results

Results of trial 1 are shown in table 24.1. Treating with propionic acid significantly improved daily gain and efficiency of gain. Flaking twice a week and treating with 0.15% propionic acid reduced daily dry matter consumed so performance for this group was less than for the group getting milo flaked only once a week but treated with 0.25% propionic acid. This preliminary study indicates that adding propionic acid to steam flaked sorghum grain helps preserve feed quality so rate and efficiency of gain are improved.

Table 24.1 Effect of adding propionic acid to flaked sorghum grain on performance of finishing steers, Nov. 12, 1974 - Feb. 6, 1975 (86 days).

	Propionic acid		
Item	0	0.15%*	0.25%*
No. steers	18	18	18
Initial wt., lbs.	808	801.7	804.3
Final wt., lbs.	986.3	1009.8	1034.3
Gain, lbs.	178.3	208.1	230.0
A.D.G.	2.07[a]	2.42[b]	2.67[c]
Dry matter/day, lbs.	19.00[b]	17.44[a]	19.48[b]
Dry matter/lb gain, lbs.	9.18[a]	7.21[b]	7.30[b]

*Of weight of flaked milo.

[a,b,c]Values in same line with different superscripts differ sign (P<.05).

Energy Levels for Growing and Finishing Steers[1]

Mike Dikeman, Keith Bolsen, and Jack Riley

Summary

Four combinations of low (LE), moderate (ME) and high (HE) energy rations were fed to growing and finishing steers. The four treatments were: LE-ME; LE-HE; ME-ME and ME-HE. All steers were more efficient during the growing phase (473 to 750 lbs.) than the finishing phase (750 to 1050 lbs.). During the growing phase, performance of steers fed the ME ration exceeded that of steers fed the LE ration. During the finishing phase, performance of steers fed the HE ration exceeded that of steers fed the ME ration. Steers on the LE-HE treatment required more energy per lb. of gain than steers on any of the other three treatments. Carcass merit was similar for carcasses from the different treatments. The fact that these cattle were slaughtered at similar weights, and that steers on lower energy rations were fed longer, affected carcass traits more than ration energy did.

Introduction

Recent fluctuations in grain prices have renewed interest in feeding more roughage and less grain to feedlot cattle. Our objectives in this study were to measure feedlot performance and carcass merit of steers fed different energy combinations during the growing and finishing phases.

Experiment Procedures

One hundred ninety-two Angus x Limousin crossbred steers averaging 473 lbs. were allotted to eight pens of 24 steers each. Two pens were assigned to each of the four experimental treatments (table 25.1). Each pen was changed from growing phase to finishing phase when steers averaged about 750 lbs.; all steers were slaughtered at about the same average weight (1050 lbs.).

Individual weights were taken at the beginning and end of the growing phase and end of the finishing phase after steers were without feed or water 15 hrs. Final live weights at the end of the finishing phase were adjusted to a constant dressing percentage.

Steers were transported to Wilson and Company approximately 18 hrs. before slaughter. After carcasses chilled a minimum of 24 hrs., U.S.D.A.

[1] This research was supported through the Livestock and Meat Industry Council.

yield grade and quality grade data were obtained. Additionally, the left wholesale rib from 20 carcasses in each treatment was transported to KSU for further carcass compostiion (protein, fat, and water) evaluations.

Results

Feedlot performances of the steers during the growing and finishing phases are shown separately in table 25.2. .During the growing phase, steers fed the ME ration gained 23% faster and 6% more efficiently than steers fed the LE ration. In the finishing phase, the HE ration supported 14% faster and 9% more efficient gains than the ME ration. All steers made their most efficient gains during the growing phase. One ton of dry matter from the ME ration produced 246 lbs. of gain in the growing phase; 193 lbs. in the finishing phase.

Feedlot performances for the four treatements are shown in table 25.3 ; total feed requirements per steer, in table 25.4 . Steers on the LE-HE treatment required more energy per lb. of gain than steers on any of the other three treatments. The price of feeds will not be the same for all cattle feeders at any one time. However, using current feed prices in Manhattan (early January, 1976), the ME-ME treatment gave the lowest feed cost per lb. of gain; the LE-HE treatment, the highest.

Carcass data in table 25.5 suggest that the steers on each treatment were similar in carcass composition traits. Fat thickness only ranged from .49 inch to .56 inch, and yield grades only ranged from 2.6 to 3.2. Marbling scores and quality grades were also similar for carcasses on the different treatments. Because time on feed influences marbling, and because cattle were slaughtered at similar weights, steers on the lower energy rations graded as well as those on the higher energy rations.

Table 25.1 Experimental Treatments Tested with Growing and Finishing Steers

Treatment designation	Energy level of the ration[1]: Growing phase	Finishing phase
1. LE-ME	low	moderate
2. LE-HE	low	high
3. ME-ME	moderate	moderate
4. ME-HE	moderate	high

[1]All rations contained rolled milo, forage sorghum silage, soybean meal and supplement.

Table 25.2 Feedlot Performances of Steers During The Growing and Finishing Phases.

Item	Rations: Growing phase LE	Growing phase ME	Finishing phase ME	Finishing phase HE
No. of days	153	125	148	133
No. of steers	94	95	95	94
Initial wt., lbs.	473	473	747	756
Final wt., lbs.	750	753	1045	1062
Avg. total gain, lbs.	277	280	298	306
Avg. daily gain, lbs.	1.81	2.24	2.01	2.30
Avg. daily feed, lbs.[1]				
Silage	10.18	6.29	8.88	2.99
Milo	2.23	8.94	10.00	16.86
Soybean meal	2.19	1.95	.87	.86
Supplement	.93	1.00	1.08	1.06
Total	15.53	18.18	20.83	21.77
Feed/lb. of gain, lb.	8.58	8.12	10.36	9.46

[1] 100% dry matter basis.

Table 25.3 Feedlot Performances of Steers for Each Experimental Treatment

Item	Experimental treatment: LE-ME	LE-HE	ME-ME	ME-HE
No. of days	306	288	269	255
No. of steers	47	47	48	47
Initial wt., lbs.	471	474	471	475
Final wt., lbs.	1060	1061	1031	1057
Avg. total gain, lbs.	589	587	560	582
Avg. daily gain, lbs.	1.92	2.05	2.08	2.28
Avg. daily feed, lbs.[1]				
Silage	10.16	6.85	8.15	4.53
Milo	5.47	9.86	8.12	12.28
Soybean meal	1.58	1.52	1.44	1.42
Supplement	1.00	1.03	1.00	1.00
Total	18.21	19.26	18.72	19.23
Feed/lb. of gain, lbs.[1]	9.48	9.40	9.00	8.43

[1] 100% dry matter basis.

Table 25.4 Total Feed Required for each Experimental Treatment.

Item	Experimental treatment			
	LE-ME	LE-HE	ME-ME	ME-HE
Total gain/steer, lbs.	589	587	560	582
Total feed/steer, lbs. (as fed moisture basis)				
Silage[1]	7772	4932	5480	2888
Milo [2]	1969	3340	2570	3684
Soybean meal[3]	537	486	349	402
Supplement[3]	340	330	299	283

[1]40% dry matter
[2]85% dry matter
[3]90% dry matter

Table 25.5 Carcass Yield Grade and Quality Grade Data for Each Experimental Treatment

Item	Experimental treatment			
	LE-ME	LE-HE	ME-ME	ME-HE
Hot carcass wt., lb.	662	667	644	658
12th rib fat th., in.	.53	.50	.49	.56
Kidney knob, %	3.7	3.1	3.3	3.7
Rib eye area, sq. in.	12.45	12.84	13.17	12.23
Yield grade	3.1	2.8	2.6	3.2
Marbling score[a]	12.8	11.2	12.0	12.4
Quality grade[b]	7.3	6.7	6.9	7.2

[a]11=small^{o}, 12= small+, 13 = modest-, etc.
[b]6 = Good+, 7 = Choice-, 8 = Choice^{o}, etc.

Evaluation of the New (U.S.D.A., 1974) Carcass Beef Quality Grade Standards

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Summary

Carcasses from 1,117 steers from Hereford and Angus dams mated artificially to Hereford, Angus, Charolais, Jersey, South Devon, Simmental and Limousin sires were studied. The study was to evaluate the U.S.D.A, 1965 quality grade ('65-QG) standards in relation to palatability of rib steaks, and also to see how the new grades change the distribution of carcasses in each grade. Rib steaks from 494 of these carcasses were cooked and evaluated by a taste panel; a rib steak from each of the 1,117 carcasses was cooked and measured for tenderness by a Warner-Bratzler shear-device. All data were adjusted to a constant carcass weight of 626 lb.

Fifty-eight percent of the carcasses graded Choice or higher by '65-QG standards and 68% by '74-QG standards. Restricting the Good grade marbling requirement and eliminating conformation increased the number of carcasses that graded Standard. Jersey sired carcasses made the largest increase to Choice or higher, while Charolais and Angus sired carcasses made the smallest increase (7% and 6%, respectively).

Generally, as quality grades evaluated by both grade standards decreased from Prime to Standard, mean values for marbling and palatability also decreased. However, there were no differences in palatability between high Good and low Choice, regardless of which set of grade standards was used. It seems highly unlikely that changes in the '74-QG standards, will make any difference consumers will recognize in the palatability of the grade of beef they are accustomed to eating.

Introduction

The recently proposed new carcass beef grade standards (U.S.D.A, 1974) differ from the U.S.D.A., 1965 grade standards on four major points. First, conformation is eliminated from quality grade standards. Second, minimum marbling requirements in Prime, Choice, Good and Standard do not increase with increasing A maturity. For B maturity and older carcasses, increases in marbling are required with increases in maturity, but mimimum marbling is decreased one degree. Third, the marbling requirement for the Good grade is narrowed. Fourth, all graded beef carcasses (except bulls) must be both quality and yield graded.

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In this study, we evaluated the two grade standards in relation to palatability of rib steaks. Distribution of carcasses graded under the 1965 and the 1974 standards is also described.

Experimental Procedure

Quality grades were determined on 1,117 carcasses of steers from Hereford and Angus cows artificially mated to Hereford, Angus, Charolais, Jersey, South Devon, Simmental and Limousin bulls. These steers were from the "cattle germ plasm evaluation project" at the U.S. Meat Animal Research Center, Clay Center, Nebr. Calves were weaned each year (three years) when approximately 215 days old, conditioned 28 days, assigned to feeding groups, then slaughtered after approximately 184, 218 or 251 days on feed.

Quality grades were determined by U.S.D.A. 1965 quality grade ('65-QG) standards 24 hours after slaughter. A steak at the 10th rib from each of the 1,117 carcasses were frozen, later thawed, cooked at 350F to an internal temperature of 151F and sheared by a Warner-Bratzler shear device. A steak at the 11th rib from 494 of the carcasses (equal number from each breed) was cooked and evaluated by a six-member taste panel.

Quality grades under the U.S.D.A., 1974 quality grade ('74-QG) standards were computed from original cooler data for individual carcasses; all were A maturity. Data were analyzed with all carcasses adjusted to a constant carcass weight of 626 lb.

Results and Discussion

Least squares means for marbling and palatability characteristics within levels of quality grade are shown in table 26.1. Generally, as quality grades (evaluated by both grade standards) decreased from Prime to Standard, marbling and palatability also decreased. Yet it must be appreciated that the mean values for taste panel tenderness and overall acceptability in any grade were above 5, the minimum required to be judged acceptable.

The important point in table 26.1 is the comparison between low Choice and high Good palatability traits since the '74-QG standards allow many cattle graded high Good by the '65-QG standards to grade low Choice. There were not statistical or meaningful differences in Warner-Bratzler shear values or taste panel scores between high Good and low Choice, regardless of which set of grade standards was used. It seems highly unlikely that changes in the '74-QG standards will make any difference consumers will recognize in palatability of the grade of beef they are accustomed to eating.

Distribution of carcasses by quality grades under both standards are shown in table 26.2. The percentage of carcasses graded Choice or higher was 58% using '65-QG standards and 68% using '74-QG standards. The percentage of carcasses that graded Good was 41% using '65-QG standards and 26%

using '74-QG standards. Carcasses that graded Standard was 1% using '65-QG standards and 5% using '74-QG standards.

Table 26.3 shows the distribution of carcasses by sire breed under the two grade standards. The greatest percentage increase in carcasses that graded Choice or higher ('65-QG versus '74-QG) was for Jersey sired steers (23%) and the lowest percentage increase was for Charolais (7%) and Angus sired steers (6%). The large increase for Jerseys results from removing conformation from the grading system since Jersey crosses generally rate lower in conformation relative to quality. The increase also reflects flattening the minimum marbling requirement in A maturity as Jersey crosses were judged the most physiologically mature.

Narrowing the marbling requirement of the Good grade ('74-QG standards) and removing conformation contributed to the increased number of Standard carcasses. That was most evident for the faster growing, later maturing Charolais, Simmental and Limousin crosses; however, the statistical adjustment of all carcasses to a constant 626 lb. favors earlier maturing breeds.

Table 26.1 Means for Marbling and Palatability by U.S.D.A., 1965 and U.S.D.A., 1974 Quality Grade Standards

				Taste panel[3]	
Grade	U.S.D.A. standards	Marbling[1]	W.B. shear, kg.[2]	Tenderness	Overall acceptability
High Prime	'65-QG	-----	----	----	----
	'74-QG	25.68	2.67	8.13	7.86
Avg. Prime	'65-QG	25.82	2.31	7.95	7.89
	'74-QG	22.22	2.80	7.85	7.86
Low Prime	'65-QG	21.41	2.90	7.99	7.73
	'74-QG	18.08	2.90	7.85	7.72
High Choice	'65-QG	17.47	2.95	7.73	7.62
	'74-QG	16.48	3.10	7.53	7.48
Avg. Choice	'65-QG	14.53	3.16	7.44	7.42
	'74-QG	13.86	3.16	7.34	7.33
Low Choice	'65-QG	11.65	3.14	7.32	7.28
	'74-QG	10.97	3.20	7.27	7.26
High Good	'65-QG	9.90	3.21	7.25	7.28
	'74-QG	9.12	3.16	7.32	7.31
Avg. Good	'65-QG	8.60	3.36	7.06	7.08
	'74-QG	8.17	3.30	7.07	7.06
Low Good	'65-QG	6.73	3.32	6.80	6.85
	'74-QG	7.20	3.40	6.83	6.91
High Standard	'65-QG	5.54	3.68	6.69	6.90
	'74-QG	5.85	3.20	6.95	6.92
Avg. Standard	'65-QG	----	----	----	----
	'74-QG	4.78	3.57	6.44	6.68

[1]Marbling: 10=small-, 11=small^{0}, 12=small+, etc.

[2]Warner-Bratzler shear: kilograms of force required to shear 1.27 cm. (½ in.) diameter core. Each mean is average of 8 shears.

[3]Taste panel: scale of 1=extremely undesirable, ..., 9=extremely desirable.

Table 26.2 Distribution of Carcasses by USDA, 1965 and USDA 1974 Quality Grade Standards.[1]

Grade		'65-QG	'74-QG
	High	0	12
Prime	Avg.	6	14
	Low	18	37
	High	69	87
Choice	Avg.	213	215
	Low	341	395
	High	210	129
Good	Avg.	150	95
	Low	93	64
	High	12	45
Standard	Avg.	4	23
	Low	1	1

[1] Number of carcasses in each grade.

Table 26.3 Distribution of Carcasses by Breed of Sire for USDA, 1965 and USDA, 1974 Quality Grade Standards.[1]

		Breed of Sire													
		Hereford		Angus		Charolais		Jersey		South Devon		Simmental		Limousin	
Grade		65 QG	74 QG	65 QG	74 QG	65 QG	74 QG	65 QG	74 QG	65 QG	74 QG	65 QG	74 QG	65 QG	74 QG
Prime	high	--	--	--	2	--	4	--	6	--	--	--	--	--	--
	avg.	--	1	3	5	2	1	1	5	--	2	--	--	--	--
	low	2	4	8	12	6	3	1	10	--	5	1	2	--	1
Choice	high	10	12	24	22	4	7	15	31	9	5	6	9	1	1
	avg.	31	30	50	50	30	31	35	36	23	24	28	28	16	16
	low	68	81	53	58	63	71	38	33	33	34	54	70	32	48
Good	high	38	22	21	14	30	20	30	8	13	10	30	23	48	32
	avg.	17	15	17	9	24	17	9	2	9	6	29	10	45	36
	low	14	8	5	6	14	8	5	2	7	5	22	17	26	18
Standard	high	2	8	1	4	1	9	--	1	--	2	3	8	5	13
	avg.	--	1	--	--	2	5	--	--	--	1	1	7	1	9
	low	--	--	--	--	1	1	--	--	--	--	--	--	--	--

[1]Number of carcasses in each grade.

Reliability of U.S.D.A. Beef Carcass Yield Grades in Reflecting Differences in Retail Yields

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Summary

Retail cut-out and U.S.D.A. yield grade data were obtained on 1,121 carcasses of steers from Hereford and Angus dams mated artificially to Hereford, Angus, Jersey, Limousin, South Devon, Simmental and Charolais bulls. Calves were weaned when approximately 215 days old, conditioned 28 days, fed an average of 218 days after weaning before being slaughtered in a commercial slaughter plant. Carcass cooler data were obtained and the right side of each carcass was cut into closely trimmed, essentially boneless retail cuts at the KSU food service building.

Beef yield grades do reflect definite differences in retail yields. Statistical tests indicated less than one chance in 1,000 that such differences occurred by chance and that the yield grade differences were real.

The average difference in retail product percentage between yield grades was 4.6 percent. The average difference in fat trim percentage was 5.6 percent. For 700-pound carcasses, that's a difference of 39.2 pounds of waste fat, or 32.2 pounds of retail product. The difference in bone percentage would account for the other 7 pounds.

Introduction

Three years of retail cut-out data and U.S.D.A. yield grade data from the U.S. Meat Animal Research Center's "cattle germ plasm evaluation project" were studied to assess how reliably yield grades reflect differences in carcass retail yields. Dr. Keith Gregory, director of the U.S. Meat Animal Research Center (MARC) at Clay Center, Nebr., initiated the project. Kansas State University and the Standardization Branch, A.M.S., U.S.D.A. are cooperating.

Experimental Procedure

The MARC-KSU research involved 1,121 steer carcasses ranging from U.S.D.A. Standard through Prime. The carcasses were from the same steers described in the article on quality grades just preceeding this one.

Appreciation is extended to Miss Jean Riggs and Mr. Garland Lewis, Housing and Food Service, Kansas State University for their cooperation in allowing the use of the food service meat cutting facilities for this project.

Steers were transported to a commercial slaughter plant for slaughter and after a 24-hour chill, the carcasses were evaluated for U.S.D.A. quality grades and yield grades by representatives of MARC, KSU and the Standardization Branch, A.M.S., U.S.D.A.

The right side of each carcass was transported to the food service building at KSU for detailed cut-out evaluation. All wholesale cuts as well as the kidney knob were weighed individually. The round, loin, rib and chuck were cut into roasts and steaks, lean trim for ground beef, bone, and fat trim, and each component weighed separately. All cuts were made boneless except the short loin strip and rib roast. All steaks and roasts were trimmed to a maximum fat thickness of 0.3 inch, the common fat covering on retail cuts in supermarkets. The lean trim from each wholesale cut was trimmed to contain 25 percent fat.

Cutability percentage represented the roast and steak meat plus lean trim from the round, loin, rib and chuck divided by carcass side weight. Retail product percentage represented the total roast and steak meat plus lean trim divided by carcass side weight.

Results and Discussion

Percentages of cutability, retail product and fat trim are shown in table 27.1. Statistical tests of the tabulated data indicated less than one chance in 1,000 that such differences occurred by chance, and that the yield grade differences were real.

The usefulness of yield grading was exemplified by comparing the distinct difference in percentages of retail product and cutability for the different yield grades. The differences in percentages of retail product between yield grades were not exact (range of 3.9% to 5.3%), apparently because the yield grades are not perfectly accurate and probably because our cutting and trimming procedures were not perfectly consistent. Nevertheless, yield grades distinctly reflected cut-out differences. If one were to compare a Choice 700-pound, yield grade 2 carcass and a Choice 700-pound, yield grade 4 carcass, there was 9.8 percent difference (70.1 versus 60.3 percent) in retail product. That equals 68.6 pounds difference. At $1.25 per pound of retail product, that's a distinct difference of $85.75 between yield grades 2 and 4. That doesn't include feed wastage in producing the yield grade 4 carcass nor the extra labor in cutting the carcass into retail cuts.

The difference in percentage of fat trim was approximately 5.6 percent between yield grades. The reason that this difference exceeds the difference in retail product (approximately 4.6 percent) is because of the difference in bone percentage between yield grades; yield grade 1 carcasses have a greater proportion of bone than yield grade 5 carcasses do.

Comparing actual cutability percentages in our study with predicted cutability by the U.S.D.A. yield grade equation reveals that as yield grade regresses from 1 to 5, the spread between acutal and predicted yield widens (1.4, 2.2, 3.4, 4.1 and 4.3 percent, respectively). That is explained by the fact that the U.S.D.A. original work trimmed cuts to 0.5 inch of fat covering while our procedure trimmed to 0.3 inch of fat. Therefore, as the yield grades regressed from 1 to 5, the proportion of trimmable fat increased in our study compared with the original U.S.D.A. work.

If the excess fat is not removed from retail cuts, obviously the actual differences in retail cut-out between yield grades will not be reflected. It doesn't matter whether the carcass is partially or totally fabricated by the packing plant, the wholesaler, or the retailer, the retail cut-out differences are difinitely there.

Table 27.1 Retail product, fat trim and cutability percentages of 1,121 steer carcasses, and U.S.D.A. predicted cutability percentages for the five yield grades.

No. of carcasses	Average yield grade	MARC-KSU retail product, %*	MARC-KSU fat trim, %*	MARC-KSU cutability, %*	U.S.D.A. cutability, %**
161	1.7	75.0	10.7	51.6	53.0
441	2.6	70.1	16.4	48.8	51.0
442	3.5	64.8	22.6	45.5	48.9
91	4.4	60.3	28.0	42.7	46.8
6	5.5	56.4	32.6	40.0	44.3

*Each retail product, fat trim and cutability percentage differed significantly (P<.001) for the five yield grades.

**Cutability percentage predicted by the U.S.D.A. yield grade equation.

Methods of Improving Quality of Grass-fed Beef

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Summary

Ten steers of known background, approximately 18 months old, and wintered on alfalfa and protein were finished on a brome and bluestem grazing program. Carcass characteristics were measured. The influence of conditioning carcass halves at 55F until eight hours post-mortem was compared with conventional chilling at 36F. Finally, the effects of vacuum storage and display on beef quality were evaluated.

The carcasses, as expected, were light with little external or internal fat. Mean yield grade was 2.2; average carcass quality grade, high standard.

Carcass halves conditioned at 55F until eight hours post-mortem and those conventionally chilled at 36F did not differ in lean color, taste panel flavor, juiciness, tenderness, over-all acceptability, or tenderness as measured by shear force.

Vacuum aging 21 days improved muscle color brightness and gave slightly less yellow fat compared with steaks cut 48 hours post-mortem.

Flavor desirability of fat did not differ between fresh cut steaks and those from muscles held 21 days under vacuum, nor was it affected by five days' display.

Flavor of muscle was scored more desirable for samples held 21 days under vacuum and before display than flavor of meat from any other treatment.

Taste panel tenderness and shear force were generally optimum after 21 days of vacuum storage and display for five days.

Most acceptable were steaks from muscles held in vacuum before display; least acceptable were steaks processed 48 hours post-slaughter.

Display for five days decreased flavor and over-all acceptability if cuts were vacuum aged before displayed, but five days' display generally improved flavor and acceptability when steaks were cut at 48 hours post-slaughter.

Vacuum storage for 21 days pre-display yielded the most acceptable product. Perhaps less vacuum storage time would give the same favorable

changes.

Our preliminary data indicate that steaks from grass-fed beef (even though they graded only high standard) are generally acceptable in several quality attributes. Tenderness and fat color problems encountered may be remedied by using optimum post-mortem conditioning procedures. Channeling grass finished beef into boxed beef sales improved its display color, tenderness, and taste.

Introduction

Recent high feed grain prices have generated considerable interest in marketing forage finished beef when weather, export agreements, or other factors make grain unprofitable to feed.

Some forage finishing procedures produce acceptable beef for all methods of processing and cookery, but some do not.

In 1974, Kropf, Allen, and Thouvenelle reported quality problems, expecially poor tenderness, of broiled rib eye (longissimus) muscle steaks from grass-fed steers taken off Flint Hill pasture in late season.

Conditioning at elevated temperatures after slaughter improves tenderness and may improve grass or forage finished beef.

Experimental Procedure

We evaluated beef finished on only grass, on 80 percent concentrate and 20 percent corn silage for seven or 14 weeks, or on 60 percent corn silage and 40 percent concentrate for 14 weeks; however, only results from grass finished beef are reported here.

Ten grass-fed steers of known background, approximately 18 months old, from the U.S.D.A. Meat Animal Research Center at Clay Center, Neb., were used. In addition to brome and bluestem grass, they had a wintering ration of alfalfa and protein supplement. All were slaughtered in September after fasting overnight (12-15 hours).

To follow post-mortem pH decline, we took samples from carcass halves at hourly intervals beginning one hour post-mortem and continuing to eight hours post-mortem, then another sample at 24 hours post-mortem.

Temperature decline was obtained on five carcasses by inserting thermometers just beneath the subcutaneous fat, in the center of the rib eye muscle, and in the round.

Beginning at approximately 1.5 hours post-mortem, the right side of each carcass was conventionally chilled at 36F until 48 hours post-mortem; the left side was conditioned at 55F until eight hours post-mortem, then chilled at 36F for 40 hours.

At about 48 hours post-mortem, chilled carcasses were weighed and evaluated for U.S.D.A. Quality and Yield Grade and other characteristics.

Four muscles including biceps femoris and semitendinosus from the bottom round, semimembranosus from the top round and longissimus (loin eye) from each half were evaluated. The anterior half of each muscle was immediately fabricated into test steaks; the posterior half was vacuum packaged and stored at 32F for 21 days. After 21 days of vacuum storage, the posterior muscle portion was cut into test steaks. Selected test steaks were evaluated from the muscle halves before and after five days of delux warm white fluorescent light display at 34F under 100-foot candles. All display steaks were oxygenated before being packaged in a styrofoam tray overwrapped with polyvinylchloride film.

Steaks for visual lean color evaluations were scored the day they were cut and after one, three, and five days' display. Visual color was scored by five panelists. Subcutaneous fat color also was evaluated by the five panelists prior to display.

At the proper sampling time before or after vacuum packaging and before or after display, steaks (1.2 inch) for shear force and taste panel evaluations were taken from corresponding halves of each carcass.

Taste panel (longissimus) and shear force steaks (semimembranosus, semitendinosus, biceps femoris, and longissimus) were vacuum packaged, frozen, and stored at -15F for later analysis. Samples were in frozen storage a maximum of three weeks. Frozen samples were thawed at 36F, modified broiled in a rotary oven at 350F to an internal temperature of 151F, then sampled after cooling at room temperature for approximately ten minutes. Six 0.5 inch diameter cores were taken from each steak and each core was sheared once with the Warner-Bratzler shear apparatus as taken from the conventionally chilled (36F) steaks (longissimus). Six panelists scored lean samples for flavor, juiciness, tenderness, and overall acceptability; fat samples were scored only for flavor.

Results and Discussion

Carcass Characteristics

Carcass characteristics of the grass-fed cattle (table 28.1) were typical of those expected for cattle on relatively low nutrition. The average quality and yield grades were high standard and 2.2, respectively. The carcasses averaged approximately 560 pounds and had minimal external (0.2 inch) and internal finish (1.3% K, P, and H Fat). The average rib eye area was 10.2 square inches.

Conditioning eight hours at 55F instead of chilling at 36F did not affect carcass characteristics other than muscle texture. Muscle texture for halves chilled at 55F was coarser than for halves chilled at 36F.

Visual Color of Fat and Lean

Panelists scored color of fat from cuts vacuum stored for 21 days as slightly less yellow than those cut two days after slaughter (table 28.2). Holding carcass halves at 55F until eight hours post-slaughter did not affect fat color compared to halves chilled at 36F.

Loin eye color was brighter after the meat was held in vacuum 21 days before being cut into steaks than when cut into steaks two days after slaughter. That was true before display and after one or three days' display. Vacuum storage of the cuts, as often done in current boxed beef procedures, apparently improved the color early in display life. All groups were acceptable in color after five days of display, but the color was nearing that that consumers criticize (table 28.2).

Conditioning halves at 55F until eight hours post-slaughter compared to chilling at 36F did not affect muscle color (table 28.2).

Outside round (biceps femoris) muscle also was brighter when held under vacuum 21 days before being cut into steaks than when fabricated at 48 hours after slaughter. If a color score of 3.5 is considered as marginally unacceptable, mean of fresh muscle color scores approached unacceptable after three days of display, and all treatments were unacceptable after five days of display (table 28.2).

Taste Panel Scores

Flavor desirability of grass-fed beef fat did not differ between fresh cut steaks and those held for 21 days under vacuum, nor was flavor affected by five days of display (table 28.3).

Flavor of muscle held 21 days under vacuum before display was more desirable than flavor from any other treatment (table 28.3).

Steaks cut 48 hours post-slaughter and tested before display were the least tender of all, whether held at elevated temperature post-slaughter or not. Apparently, aging steaks either under display conditions in retail package or in vacuum for 21 days improved tenderness (table 28.3).

Poorest over-all acceptability scores were given to steaks not vacuum packed and not displayed; highest acceptability to steaks held in vacuum and cut, and not yet displayed. Acceptability deteriorated during five days of display for cuts that had been held in vacuum bags, primarily from flavor deterioration while displayed (table 28.3).

Conditioning at 55F or chilling at 36F did not significantly affect muscle flavor, juiciness, tenderness, or over-all acceptability (table 28.3).

Nearly all traits evaluated by the taste panel were acceptable.

Tenderness (Shear Force)

We used 55F conditioning to avoid suspected decreased tenderness due to rapid chilling and resultant muscle shortening during conventional chilling. That appears to be a particular problem in carcasses with a small amount of exterior fat cover (i.e., grass-fed beef).

No differences in shear force (tenderness) were observed between halves conditioned at 55F or chilled at 36F, whether evaluated before or after vacuum storage or before or after display (table 28.4). Therefore, the high conditioning temperature (55F for eight hours) did not improve tenderness (table 28.4). Our taste panel agreed regarding tenderness (tables 28.3 and 28.4).

Lowest pH was achieved eight hours port-mortem; therefore, most post-mortem metabolic activity must have been complete by eight hours and occurred at different room and product temperatures (tables 28.5 and 28.6).

No differences between post-mortem temperature treatments may have resulted from carcasses having enough exterior fat to retard cold shortening. Perhaps 36F was not cold enough to initiate cold shock; 55F was not high enough to retard cold shortening, or eight hours at 55F was not long enough to alleviate cold shortening.

Vacuum storage generally improved the tenderness of all muscles except the inside round (semimembranosus) as did display before and after vacuum packaging. The over-all best treatment from a shear force (tenderness) standpoint was vacuum storage 21 days and display five days.

Table 28.1 Mean Carcass Characteristics of Grass-fed Beef Halfs held at 55F until Eight Hours Post-slaughter versus Conventional Chilling at 36F.

Characteristic	36F	55F
Chilled Half, lbs.	282.5	282.0
Adjusted Fat Thickness, in.	0.21	0.21
Rib Eye Area, in.^{2}	10.22	10.41
Kidney-Pelvic-Heart, Fat, %	1.41	1.22
Yield Grade	2.24	2.19
Conformation Score	Good +	Good +
Muscle Texture Score[a]	5.0	6.5*
Marbling[b]	9.1	9.0
Quality Grade[c]	6.7	7.0

[a]Muscle Texture Score: 1=finest, 5=average, 10=coarsest tenderness.
[b]Marbling: 8=traces, 11=slight.
[c]Quality Grade: 5=average standard, 8=average good.
*P<.05: All other differences not statistically significant.

Table 28.2 Mean Visual Color Scores for Lean and Fat Samples Derived from 55F Conditioned and 36F Chilled Carcass Halves, Fabricated before and after Vacuum Storage, and Displayed for Five Days.

	Pre-Vacuum		Post-Vacuum		Variance Ratio	Least Significant Difference (P<.05)
	36F	55F	36F	55F		
Fat Color[a]	1.97^{d}	2.06^{d}	1.67^{c}	1.71^{c}	14.87**	0.14
Longissimus (Loin Eye) Muscle Color[b]						
Day 0	2.60^{d}	2.56^{d}	1.84^{c}	1.85^{c}	67.96**	0.14
Day 1	2.66^{d}	2.63^{d}	2.00^{c}	1.99^{c}	56.13**	0.14
Day 3	3.30^{d}	3.15^{d}	2.47^{c}	2.47^{c}	48.01**	0.18
Day 5	3.38	3.27	3.22	3.19	0.70 N.S.	
Biceps Femoris (Outside Round) Muscle Color[b]						
Day 0	2.86^{e}	2.59^{d}	1.91^{c}	1.85^{c}	220.74**	0.09
Day 1	3.00^{e}	2.87^{d}	2.21^{c}	2.14^{c}	91.92**	0.13
Day 3	3.53^{d}	3.44^{d}	2.92^{c}	2.97^{c}	16.77**	0.21
Day 5	3.74	3.67	3.54	3.60	1.67 N.S.	

**(P<.01): N.S.=Non Significant.

[a]Fat Color: 1=white, 2=slightly yellow, 3=moderately yellow; evaluated at Day 0.

[b]Muscle Color: 1=very bright red, 2=bright red, 3=slightly dark red or brown, 4=dark red or brown, 5=extremely dark red or brown.

[cde]Means within same row with same or no superscript letter are not different (P>.05).

Table 28.3 Mean Taste Panel Scores[z] for Longissimus (Loin Eye) Muscle and Fat Samples Derived from 55F Conditioned and 36F Chilled Carcass Halves Fabricated before and after Vacuum Storage and Display.

Treatment	Fat Flavor	Muscle Flavor	Juiciness	Tenderness	Over-all Acceptance
36F Pre-Vacuum, Pre-Display	5.84	5.92[a]	6.01	4.96[a]	5.14[a]
36F Pre-Vacuum, Post-Display	5.98	5.63[a]	6.51	6.35[b]	5.84[bcd]
36F Vacuum, Pre-Display	6.28	6.61[b]	6.56	6.66[b]	6.31[de]
36F Vacuum, Post-Display	5.73	5.73[a]	6.24	6.38[b]	5.72[bc]
55F Pre-Vacuum, Pre-Display		5.78[a]	6.46	5.38[a]	5.47[ab]
55F Pre-Vacuum, Post-Display		6.05[ab]	6.44	6.72[b]	6.10[cde]
55F Vacuum, Pre-Display		6.58[b]	6.49	6.74[b]	6.48[e]
55F Vacuum, Post-Display		5.77[a]	6.45	6.51[b]	5.87[bcd]
Variance ratio (treatments)	1.57 N.S.	3.52**	1.13 N.S.	8.90**	4.70**
Least significant difference (P<.05)		0.57		0.62	0.56

**(P<.01); N.S.=Non Significant.

[abcde]Means within same column with same or no letter superscript are not different (P>.05).

[z]Flavor, juiciness, tenderness, and over-all acceptability evaluated using 9-point scale (9=most desirable, 6=slightly desirable, juicy, tender, flavorful, or acceptable).

Table 28.4 Mean Shear Force Values for Selected Test Muscles Derived from 55F Conditioned and 36F Chilled Carcass Halves Fabricated before and after Vacuum Storage and Display.

	Muscles			
Treatment	Semimembranosus	Semitendinosus	Biceps Femoris	Longissimus
36F Pre-Vacuum, Pre-Display	10.40^{b}	9.82^{bc}	13.56^{bc}	6.13^{de}
36F Pre-Vacuum, Post-Display	8.60^{a}	10.62^{c}	13.04^{bc}	4.97^{bc}
36F Vacuum, Pre-Display	12.08^{c}	8.68^{a}	12.11^{b}	4.49^{ab}
36F Vacuum, Post-Display	11.24^{bc}	8.69^{a}	9.47^{a}	4.03^{a}
55F Pre-Vacuum, Pre-Display	10.80^{b}	10.14^{c}	14.46^{c}	6.54^{e}
55F Pre-Vacuum, Post-Display	8.59^{a}	10.59^{c}	14.25^{c}	5.64^{cd}
55F Vacuum, Pre-Display	12.06^{c}	8.93^{ab}	12.19^{b}	4.67^{ab}
55F Vacuum, Post-Display	11.28^{bc}	8.78^{a}	9.07^{a}	4.12^{a}
Variance Ratio (treatments)	9.67**	5.61**	10.45**	14.42**
Least Significant Difference (P .05)	1.23	1.00	1.15	0.68

** (P<.01).

^{abcde}Means within same column with same superscript are not different (P>.05).

Table 28.5 Post-mortem pH for Carcass Halves Conditioned at 55F or Chilled at 36F.

Hours Post-mortem	36F	55F
1	6.38	6.36
2	6.07	5.96
3	5.84	5.70
4	5.74	5.61
5	5.72	5.61
6	5.65	5.60
7	5.66	5.59
8	5.65	5.58
24	5.54	5.54

Table 28.6 Post-mortem Temperature Declines and Differences for Corresponding Halves Conditioned at 55F or Chilled at 36F.

Hours Post-mortem	55F			36F			Temperature Difference		
	Round	Loin	Fat	Round	Loin	Fat	Round	Loin	Fat
2	103.5	91.0	86.0	102.9	90.5	83.0	0.6	0.5	3.0
3	102.5	87.0	78.5	101.5	85.0	72.0	1.6	2.0	6.5
4	100.0	80.0	73.0	98.0	75.0	64.0	2.0	5.0	9.0
5	97.0	75.0	69.2	94.5	68.0	59.0	2.5	7.0	10.2
6	94.0	71.0	66.5	91.5	63.0	56.0	2.5	8.0	10.5
7	91.3	68.0	64.5	88.0	59.0	53.2	3.3	9.0	11.3
8	89.0	65.0	61.5	84.5	55.2	51.0	4.5	9.8	10.5

Factors Influencing Net Income from a Steer through Feedlot

J. K. Blum, R. R. Schalles, and K. O. Zoellner

Summary

Steers entering feedlots with higher starting weight per day of age had greater net value at slaughter than lighter steers. Faster gaining steers brought the highest net income. Age on feed did not influence net income. High dressing percentage increased the net income but generally the relationship was low between carcass traits and net income.

Introduction

Conditions in the beef industry are forcing cattlemen to manage for maximum returns. This study was to determine what factors influence returns. The data were from the 1975 Kansas Steer Futurity Test and the 1975 Commercial Cattle Improvement Program.

Experimental Procedure

Commercial Cattle Improvement Program[a]- December 11, 1974, 58 steers from seven heards were put on feed at the Solomon Valley Feedlot, Inc., Beloit, Kansas. The rations were the same as those fed commercial cattle in the feedlot. Average daily gain was obtained. Steers were slaughtered at the Dubuque Packing Plant in Mankato, Kansas, when the feedlot manager felt they would grade choice. Carcass data were collected.

Kansas Steer Futurity Test [b]-One hundred forty-nine steers from nineteen herds throuahout Kansas went on feed December 6, 1974, at the Oswalt and Arnett Feedlot, Garden City, Kansas. They were fed the same rations as the commercial cattle in the feedlot. They were slaughtered and carcass data collected, when they were considered to grade choice.

Results and Discussion

The average net income per steer was \$114. Net income was defined as:

$$\text{net income} = \begin{array}{c}\text{total}\\ \text{carcass}\\ \text{value}\end{array} - \begin{array}{c}\text{pre-test}\\ \text{production}\\ \text{cost}\end{array} - \begin{array}{c}\text{feedlot cost}\\ \text{during test}\end{array} - \begin{array}{c}\text{trucking}\\ \text{cost}\end{array}$$

a Sponsored by Guarantee State Bank and Trust Company, Beloit, Kansas and Kansas Extension Services.

b Sponsored By Kansas Livestock Association and Kansas Extension Service.

Carcass value, feedlot cost during test, and trucking cost were actual costs. Production cost before going into feedlot was set at $200. Costs were not corrected for age or weight of the calf as these were primarily costs of maintaining cows. Ownership of the calves was retained by the producers.

Steers with higher starting weight per-day-of-age produced higher net incomes. One pound increase in starting weight resulted in about 50 cents increase in net income. The partial correlation coefficient between starting weight and net income (0.71) shows a close relationship.

Average daily gain (ADG) on feed for all steers was 3.04 lb. Steers with high ADG produced high net income. One pound more ADG in the feedlot increased net income $83. The partial correlation between those two factors was 0.69.

Age on test did not significantly influence net income. That was expected because pre-test costs were held constant.

Choice carcasses brought $34. per carcass more than those graded good, which shows the importance of an accurately chosen slaughter date. High dressing percentage also increased the net income significantly. All other carcass traits had little relationship to net income.

Table 29.1 Partial Correlations with Net Income

Traits	Net income
Age on test	0.04
Beginning weight	0.71
Total carcass value	0.60
Average daily gain	0.69
Kidney knob	0.19
Dressing percentage	0.45
Loin eye area	0.21
Backfat thickness	0.07
U.S.D.A. yield grade	0.08
U.S.D.A. quality grade	0.44

Table 29.2 Data from steers in comercial feedlots.

Marketing	Location	No. of steers	Age on feed days	Days fed	Beginning weight lb.	Final weight lb.	Average daily gain lb.	Backfat thickness in.	Loin eye area sq. in.	Average price/cwt. $	Net income $
5/1	Beloit	7	266	141	567	1017	3.19	0.39	10.81	71.14	58.74
5/16	Garden City	72	257	161	598	1103	3.12	0.39	12.93	79.00	137.18
5/22	Beloit	10	272	162	609	1174	3.48	0.47	12.89	76.14	146.62
5/30	Garden City	76	249	175	552	1062	2.91	0.31	12.56	79.88	114.20
6/19	Beloit	9	265	190	538	1098	2.97	0.40	13.28	83.72	130.66
7/3	Beloit	24	247	204	464	1074	3.00	0.42	11.60	83.41	89.71

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